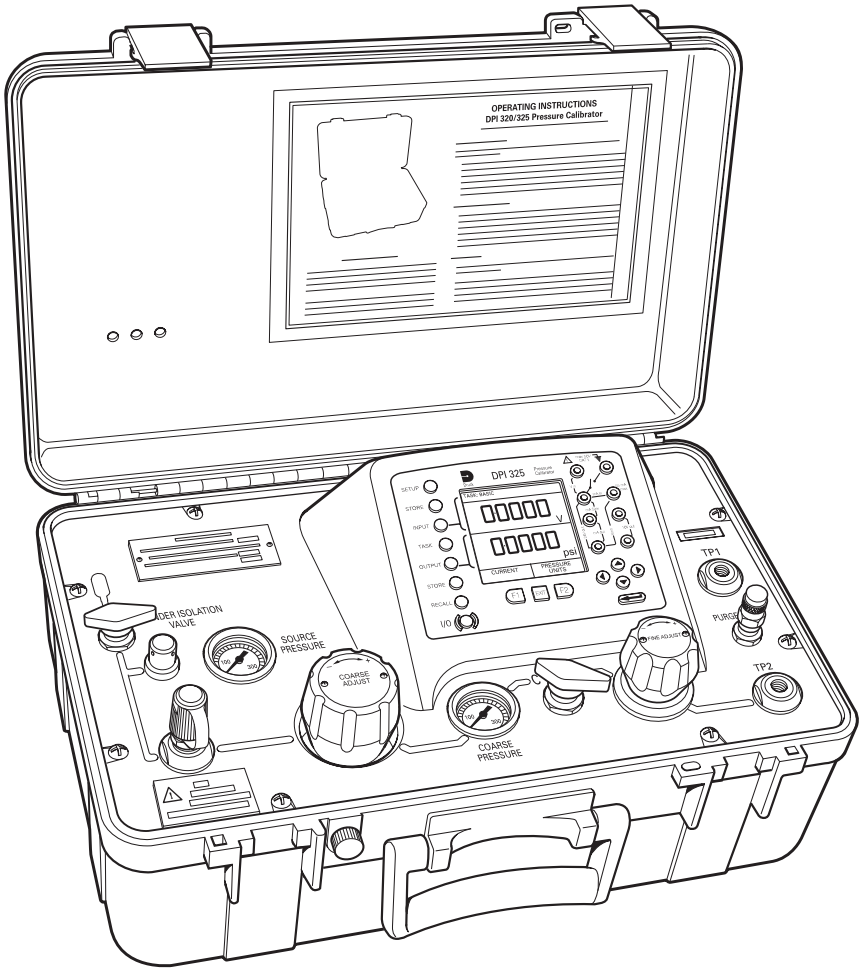
Druck
High Pressure
Pneumatic Calibrator
DPI 320/325

User Manual
KA266



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Introduction

This technical manual provides operating instructions for the DPI 320 and DPI 325 Portable Pneumatic Pressure Calibrators compatible with the requirements of line operation.

This manual is divided into the following sections.

Section 1	Introduction and Description
Section 2	Summary of Functions
Section 3	Operation
Section 4	Routine Maintenance
Section 5	Calibration

Illustrations contained in each section are used to show keypress and display sequences used for carrying out a procedure or setting. These illustrations should only be considered as typical examples since they are application specific and will depend upon the way in which the instrument is set up by the user i.e. they cannot be considered as definitive.

WARNING

This calibrator contains a 122 cu in, high pressure, gas cylinder that requires special handling and operation. Only personnel formally trained in pneumatic safety and the testing of high pressure systems and components should recharge or operate this equipment.

Safety

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. The user must not use this equipment for any other purpose than that stated, (refer to page 3-1).

This manual contains safety and operating instructions which must be followed to make sure of safe operation and to keep the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage. Use suitably qualified technicians* and good engineering practice for all procedures in this manual.

Pressure
Do not apply pressure greater than the maximum safe working pressure stated in the specification (Refer to Section 1).

CE This product meets the essential requirements of the relevant EEC directives.

Technical advice
For technical advice contact the manufacturer or subsidiary.

* A qualified technician must have the necessary technical knowledge, documentation, special test equipment and tools to carry out the required work on this equipment.

ABBREVIATIONS

The following abbreviations are used in this publication.

Note

Abbreviations are the same in the singular and plural.

°C	degrees Celsius
BSP	British standard pipe thread
cm	centimetre
°F	degrees Fahrenheit
inHg	inches of mercury
lbs	pounds
ISO	International Standards Organisation
kg	kilogram
m	metre
mbar	millibar
mm	millimetre
mmH_2O	millimetres of water
NPT	National pipe thread
PRV	pressure relief valve
psi	pounds per square inch
PTFE	polytetrafluoroethylene
SAE	Society of Automotive Engineers
UUT	Unit under test

Symbols

The following symbols mark this equipment:

Read the manual before use.

Refer to the manual.

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Table of pressure units and conversion factors (Pascals)

Pressure unit	Factor (Pascals)	Pressure unit	Factor (Pascals)
bar	100000	inHg	3386.39
psi	6894.76	inH_2O [1]	249.089
mH_2O	9806.65	ftH_2O [1]	2989.07
mbar	100	atm	1013525.0
kgf/cm^2	98066.5	kgf/cm^2	98066.5
kgf/m^2	9.80665	kgf/m^2	9.80665
mmHg	133.322	hbar	10000000
cmHg	1333.22	tonf/ft^2 (UK)	107252.0
mHg	133322.0	tonf/in^2 (UK)	15444300
mmH_2O	9.80665	inH_2O [2]	248.64135
mH_2O	98.0665	ftH_2O [2]	2983.6983
N/m^2	1	ftH_2O sea sg 1.027	3069.774
kPa	1000	mH_2O sea sg 1.027	10071.4295
MPa	1000000	ftH_2O sea sg 1.0281	3073.062
torr	133.322	mmH_2O sea sg 1.0281	10082.2168
lbf/ft^2	47.8803		

Unit Conversion

To convert FROM pressure VALUE 1 in pressure UNITS 1
TO pressure VALUE 2 in pressure UNITS 2, calculate as follows:

$$\text{VALUE 2} = \text{VALUE 1} \times \frac{\text{FACTOR 1}}{\text{FACTOR 2}}$$

Notes

The conversion factor for pressure units referenced [1] are calculated for a water temperature of 4°C. Pressure units referenced [2] are calculated for a water temperature of 68°F these units are normally used in the USA.

The sea water conversion factors are calculated for a water temperature of 32° F (0°C) Fwith a salinity of 3.5%.

Service

Approved Service Agents

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Introduction and Description

Introduction

The DPI 32X series comprises a range of rugged, portable precision high pressure pneumatic calibrators. Two versions are available, the standard model (DPI 320) and the fully documenting version (DPI 325). The calibrator uses integral pneumatic components to generate pressure over the range 0 psi to 3000 psi. The calibrator is also capable of providing electrical current and voltage to excite external devices and measuring D.C. voltages, D.C. currents and ambient temperatures.

DPI 32X calibrators are powered by an internally mounted, rechargeable Nickel Cadmium battery pack. An external power supply adapter/charger is provided and all calibrator versions have an RS232 interface.

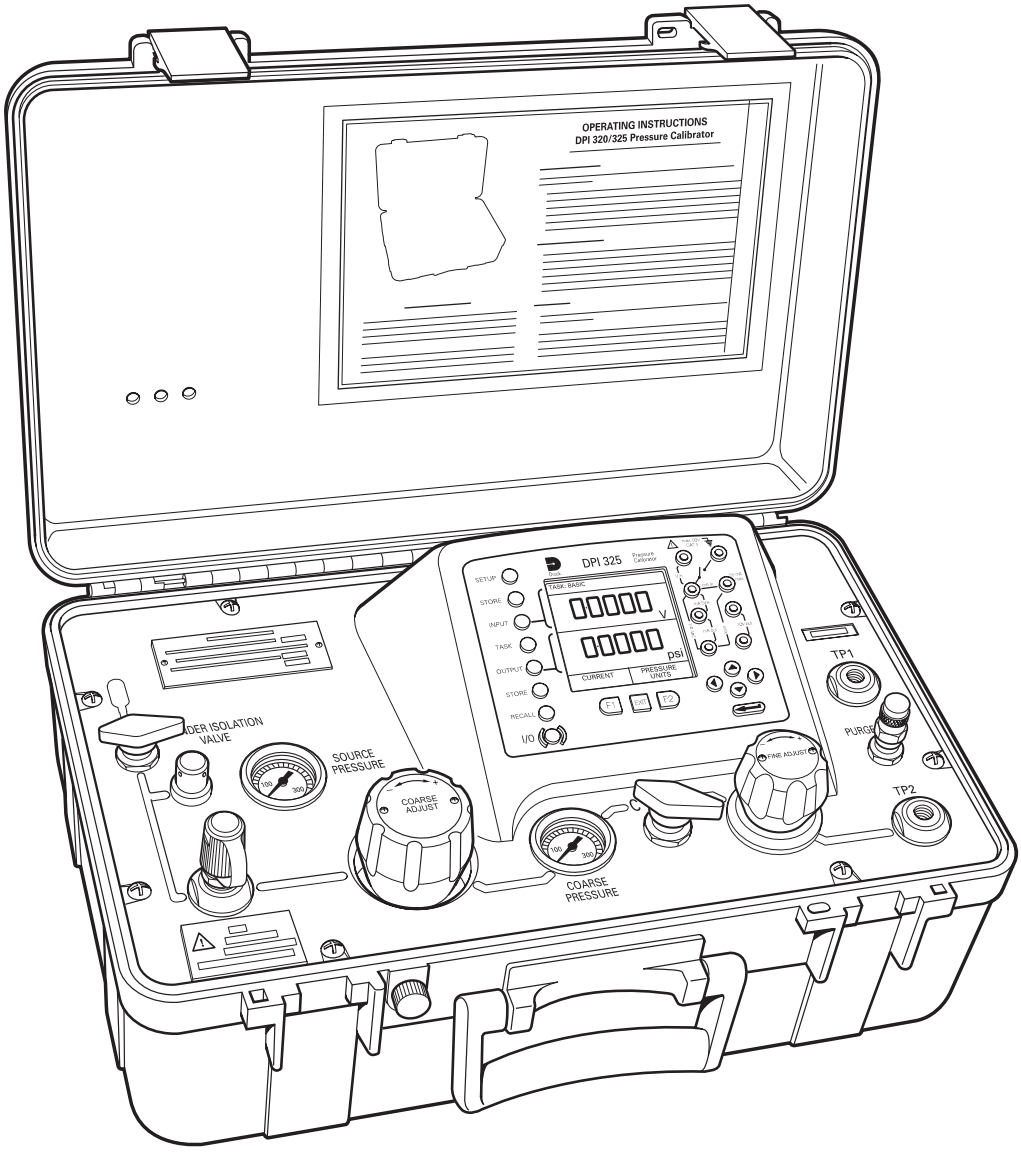

Figure 1-1 - General view

Introduction and Technical Description

Specification

Pressure range

..... 0 to 3000 psi
Maximum safe working pressure ..... 3000 psi

Accuracy

Combined non-linearity, hysteresis repeatability and temperature effects..... 0.025% of Full Scale

Temperature effects

averaged over 15°F to 105°F and with respect to 68°F ..... ±0.002% of reading/°F

Power Supply

Calibrator ..... rechargeable nickel cadmium battery pack
..... nominal use 20 hours
Charging ..... universal input charger/battery eliminator allows calibrator use while charging

Operating Conditions

Calibrated temperature ..... +15°F to +105°F (-10°C to +40°C)
Operating temperature ..... +15°F to +120°F (-10°C to +50°C)
Humidity ..... 0 to 90% non-condensing
Sealing IP54

Storage Conditions

Temperature ..... -4°F to +140°F (-20°C to +60°C)
Conformity ..... designed to EN61010
EMC emissions EN50081-1
EMC immunity EN50082-1

Electrical inputs

Voltage

range ..... ±50 V.D.C.
accuracy ..... ±0.05% reading
..... ±0.004% full-scale
resolution ..... 100 µV maximum
Input impedance ..... >10 M Ω

Current

range ..... ±55 mA D.C.
accuracy ..... ±0.05% reading
..... ±0.004% full-scale
resolution ..... 0.001 mA
auto-ranging ..... 10 Ω , 50V maximum
Temperature effects averaged and with respect to 20°C ..... ±0.0075% of reading/°C
Temperature effects averaged and with respect to 68°F ..... ±0.004% of reading/°F

Temperature

range ..... -15°F to +104°F (-10°C to 40°C)
accuracy ..... ±2°F (±1°C)
resolution ..... ±0.10°F (±0.1°C)

Electrical outputs

Voltage

range ..... 10 V.D.C.
accuracy ..... ±0.1%
maximum load ..... 10 mA maximum
range ..... 24 V.D.C.
accuracy ..... ±5%
maximum load ..... 26 mA maximum

Specification (continued)

Current

range ..... 0 to 24 mA D.C.
accuracy ..... ±0.05% reading
..... ±0.01% full-scale
resolution ..... 0.001 mA
Temperature effects averaged and with respect to 20°C ..... ±0.0075% of reading/°C
Temperature effects averaged and with respect to 68°F ..... ±0.004% of reading/°F

Special features

mA step ..... continuous cycle at 10 seconds

Function	mA output						
4 to 20 mA linear	4	8	12	16	20		
0 to 20 mA linear	0	5	10	15	20		
4 to 20 mA flow	4	5	8	13	20		
0 to 20 mA flow	0	1.25	5	11.25	20		
4 to 20 mA valve	3.8	4	4.2	12	19	20	21

Pressure units ..... 25 scale units and one user defined
mA ramp ..... continuous cycle with configured end values and 60 seconds travel time
Datalog ..... multi-parameter, internal 92 kbyte memory
..... variable sample period for data logging or log on key press for calibration results
Snap shot ..... paperless notepad stores up to 20 complete displays
Process functions ..... tare, max/min, filter, flow and %span
Language ..... English, French, German, Italian, Portuguese, Spanish
Power management ..... auto power OFF, auto backlight OFF, battery low indicator and status on key press

Display

panel ..... 60 mm x 60 mm graphic LCD with backlight
readout ..... ±99999 capability, two readings per second

Computer interface

DPI 320 ..... unidirectional for uploading results to a PC
DPI 325 ..... bidirectional for downloading procedures and uploading results

Introduction and Technical Description

Description

Pneumatic Circuit (Figure 1-2)

The pneumatic supply to the two 1/4 NPT test ports, Test 1 and Test 2, is provided by a 122 cu in gas cylinder, GB-1. This gas cylinder is charged via an AN4 charging port. An isolation valve IV-1 is used to to isolate the gas cylinder from the instrument.

When a connection is made to the charging port and a high pressure supply (Air or Dry Nitrogen Only), is applied, the check valve, CV-1, opens, allowing the gas cylinder GB-1 to charge, via IV-1, to the same pressure as the incoming supply. A pressure relief valve, PRV-1, protects the gas cylinder from overpressure by venting if the incoming supply or the gas cylinder pressure exceeds the maximum charge pressure of the instrument (refer to charge port label).

The high pressure charge complete, the charge supply can be turned off and disconnected. With no pressure on the input side of the charge port, or a pressure lower than that of the gas cylinder, check valve CV-1 is closed, locking the gas cylinder supply into the calibrator. The charge pressure of the gas cylinder (pressure available for testing), is indicated by pressure gauge PG-1.

On the output side of the calibrator, a manually operated, self venting regulator REG-1 provides a coarse means of setting the output pressure.

The unit under test (UUT) is connected to one of the test ports (the other usually being capped off). If required, the second test port can be connected to a second UUT for simultaneous testing.

A manually operated, normally closed, purge valve PV-1 is located between the two test ports. This valve allows the user system and calibrator to be vented prior to any tests being carried out, thereby preventing an external system connected to the instrument from introducing any contaminants to it.

Having connected a UUT, the ball valve BV-1 is manually switched to **Coarse** (open as drawn), and the output pressure set to approximately the required level, as indicated on the coarse pressure gauge PG-2, by means of the regulator REG-1. The true output pressure is given by the calibrator display. Valve BV-1 is then switched to Fine, removing the supply derived from the gas cylinder and REG-1. The pressure in the output ports can then be trimmed to the required pressure, as indicated on the instrument display, by means of the volume adjuster VA-1.

A pressure to voltage transducer (PDCR), located on the outlet manifold, interfaces with the calibrator electronics to provide a high precision readout of the output pressure. Pressure gauge PG-2 (**Coarse Pressure**), permanently indicates the pressure output of the regulator, providing a coarse indication of the pressure at the the output of REG-2. The reading on PG-2 should only be used as an indication of the instrument's output pressure. The true output pressure should always be read from the digital display.

The general procedure for operation of the calibrator is described in Section 3, pages 3-5 and 3-6.

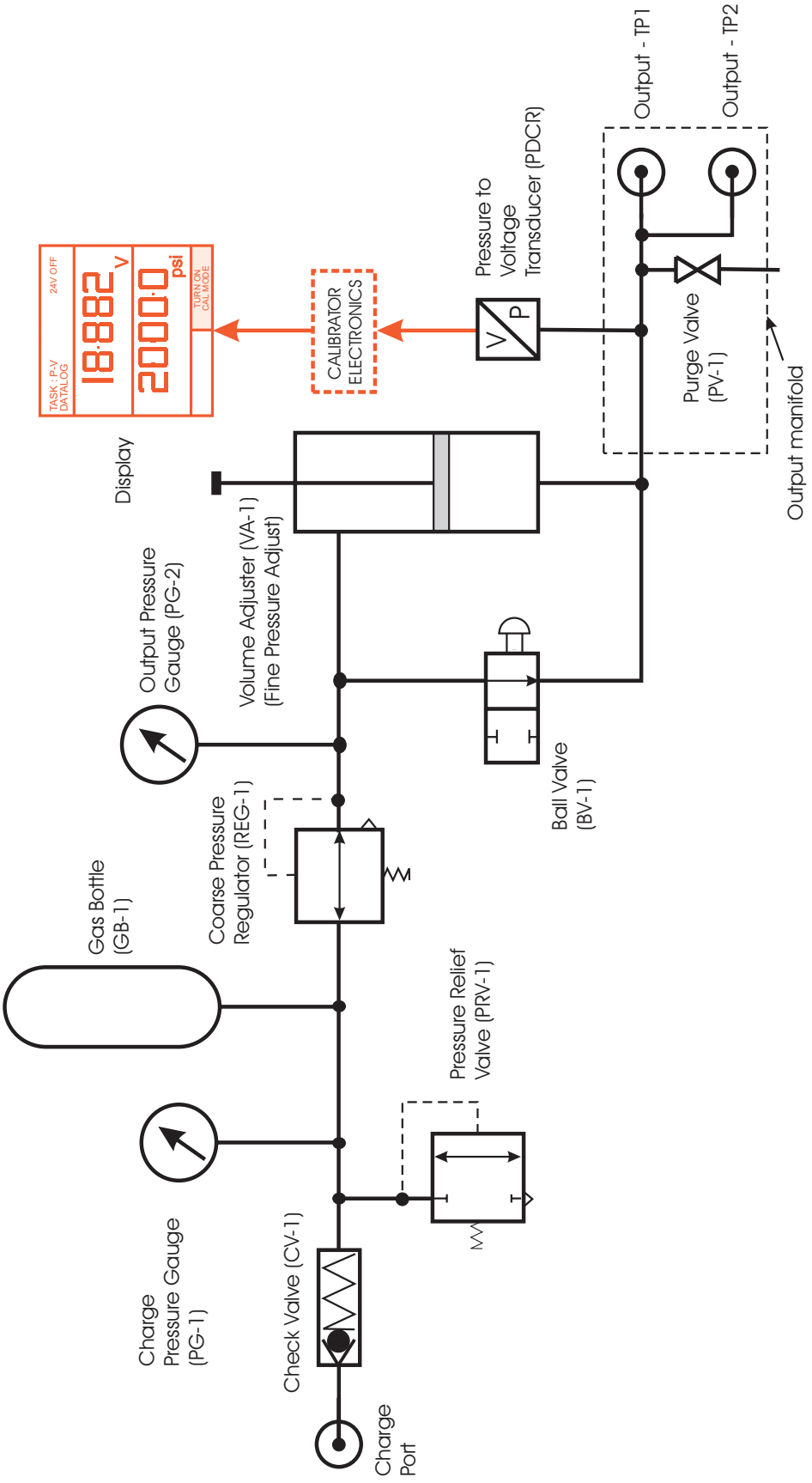

Figure 1-2 - Pneumatic System Schematic

Electrical Circuit (Figure 1-3)

Power for the calibrator electronics is supplied by a 7.2V Nickel Cadmium battery pack. A power supply unit within the calibrator electronics supplies all the required internal and external power supplies and the battery charging system. An external power supply unit (max input 15 V dc), supplies power for the battery charger.

Pressure in the outlet manifold is sensed by a pressure to voltage transducer. The output of this transducer passes through an interface, is digitized and applied to the microprocessor where it is processed to provide a pressure display.

Optionally, an external pressure to voltage transducer (remote transducer) can be used to extend the measurement range of the instrument. This remote transducer is also a pressure to voltage device and operates in a similar manner to the internal transducer.

The microprocessor communicates with the keyboard to enable the various operational modes to be selected and input/output data to be processed.

The measurement circuits include pressure, input voltage, input current and switch test. A 24V external power supply is provided to enable current loops to be powered directly from the calibrator. Additionally, a fully floating 10V dc supply is provided to enable the calibrator to power transducers under test.

An RS232 port permits datalog data to be uploaded to an external PC system. On the fully documenting version of the calibrator (DPI 325), test procedures are also downloaded to the calibrator via the RS232 port (see Section 3, page 3-31).

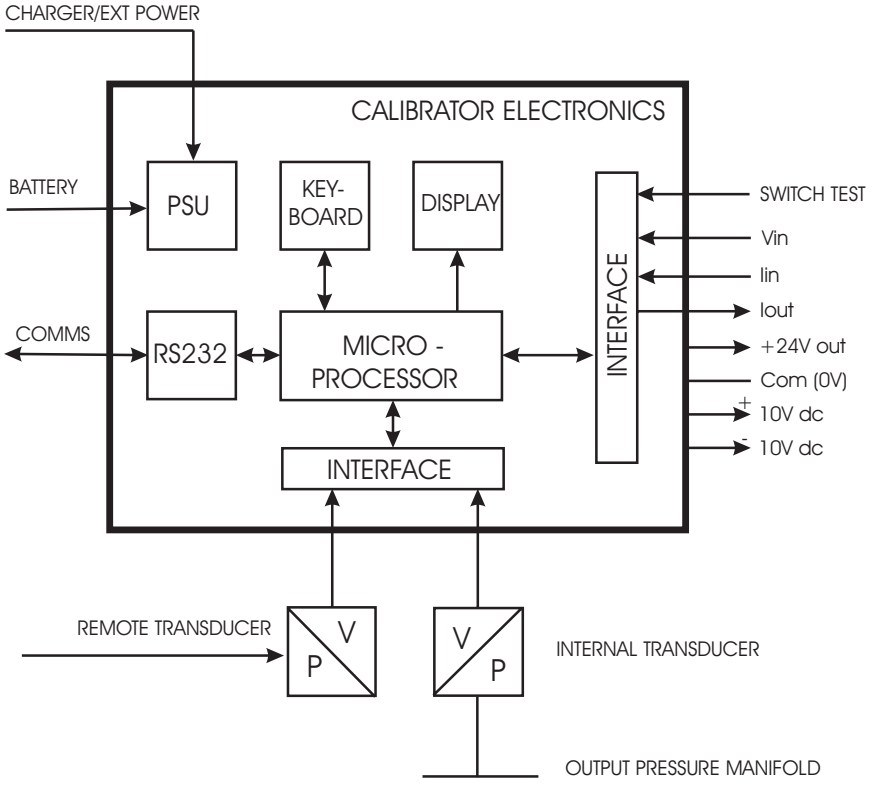

Figure 1-3 - Electrical System Schematic

Storage and Packaging

Procedure

The unit should be at zero/ambient pressure. Disconnect all cables and stow in the lid.

- Before storing, connect the external power/charger adapter and fully charge the internal battery.
- Ensure that the calibrator is switched off.
- Fully discharge the gas bottle as described in Section 3, page 3-3.

If available, use the original packing material. When using packing materials other than the original, proceed as follows:

- Wrap unit in polyethylene sheeting.
- Select a double-wall cardboard container. Inside dimensions must be at least 15 cm greater than the equipment. The carton must meet test strength requirements of ≥125 kg.
- Protect all sides with shock-absorbing material to prevent equipment movement within the container.
- Seal carton with approved sealing tape.
- Mark carton “FRAGILE” on all sides, top, and bottom of shipping container.

To return the unit for calibration or repair complete the return material procedure as detailed in 1.8.

Environment

- The following conditions apply for both shipping and storage:
  - Temperature Range ..... -4°F to +140°F (-20°C to +60°C)

Returned Materials Procedure

Should the unit require calibration or become unserviceable it can be returned to the Druck Service Department.

Please contact our Service Department, either by 'phone, fax or E-mail, to obtain a Returned Material Authorization [RMA] number, providing the following information:

Product (i.e. DPI 325)
Serial number
Details of defect/work to be undertaken
Calibration traceability requirements
Operating conditions

Safety Precautions

You must also tell us if the product has been in contact with anything hazardous or toxic and, the relevant MSDS references and precautions to be taken when handling.

Important notice

Service or calibration by unauthorized sources will affect the warranty and may not guarantee further performance.

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Summary of Functions

General

The DPI 32X series calibrators are primarily used for calibrating transducers and pressure systems over the range 0 to 3000 psi. The calibrators are also capable of sourcing and sinking an external current loop up to a maximum output current of 24 mA and measuring dc voltages of ± 50V and dc currents of ± 55 mA. Ambient temperature measurement is also provided.

DPI 32X series calibrators are powered by an internal rechargeable Nickel Cadmium battery pack. An external power supply/charger is provided and all instrument versions have an RS232 interface.

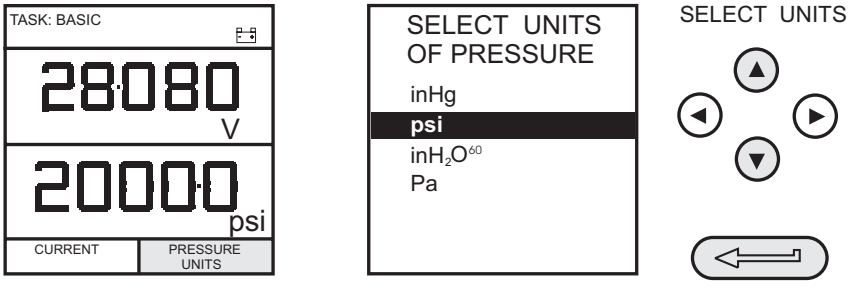
Pneumatic Controls (Figure 1)

Control Panel

In the procedures outlined in this section, hard (fixed function) and soft (variable function) key operations are shown in bold type (e.g.) **TASK** and **F1**. These statements mean press the **TASK** key and press the **F1** key. Soft key operations can be allocated to both the F1 and F2 keys. Where a specific soft function is referred to it is written in bold italics (e.g.) ***PROCESS***. Unless otherwise indicated, the following procedures apply to both the DPI 320 and DPI 325 models.

Modes and Procedures

This instrument has a number of operating modes which are described in simplified form in the following sections. Diagrams accompanying the procedures give typical selection sequences and shaded controls indicate that this control key should be pressed in the appropriate sequence. Diagrams should be read from left to right, top to bottom where appropriate. A shaded display soft box indicates that the function key immediately below that soft box should be pressed (either **F1** for the left hand soft box or **F2** for the right). A typical diagram is shown below (e.g.).



In the above diagram the following key sequence is indicated.

(a) Press the F2 key (the key immediately below the ***PRESSURE UNITS*** soft box).

(b) Use the **Up** and **Down** cursor keys (only) to select the required option. (If all keys shaded, use all these keys to select or enter data).

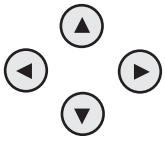
(c) Press the **ENTER** key.

Summary of Functions

Key Symbols

The following key symbols are used in the procedure diagrams which follow

SELECT VALUE



Shaded cursor keys indicate that a combination of these four keys, Up, Down, Left and Right should be used to (e.g.) enter an alpha numeric value or to select a function.

Indicates the **ENTER** key. Used to confirm an operation or a selection. Shading indicates key operation.

EXIT

Exit key, used to clear current menu selection and return to next menu level above current level. Used as an escape key from current operation. Shading indicates key operation.

RECALL ◯

Hard key (total 7). Legend beside key symbol indicates function. Shading indicates key operation.

Maximum Instrument Ratings

The following table shows the maximum measurement input ratings of the instrument which should not be exceeded.

PRESSURE	120% FULL SCALE
VOLTAGE	50 V d.c.
CURRENT	55 mA d.c.

Notes

1. *The display flashes if the voltage or current over-range by 110% of the above values.*
2. *Max applied voltage for external loop supply = 30V dc (see Page 3-4).*

CALIBRATOR CONTROLS

The location of the calibrator controls is shown in Figure 2-1. These controls divide into two groups, the pressure generation components, shown in Figure 2-1, and the operator/display controls shown in Figure 2-2.

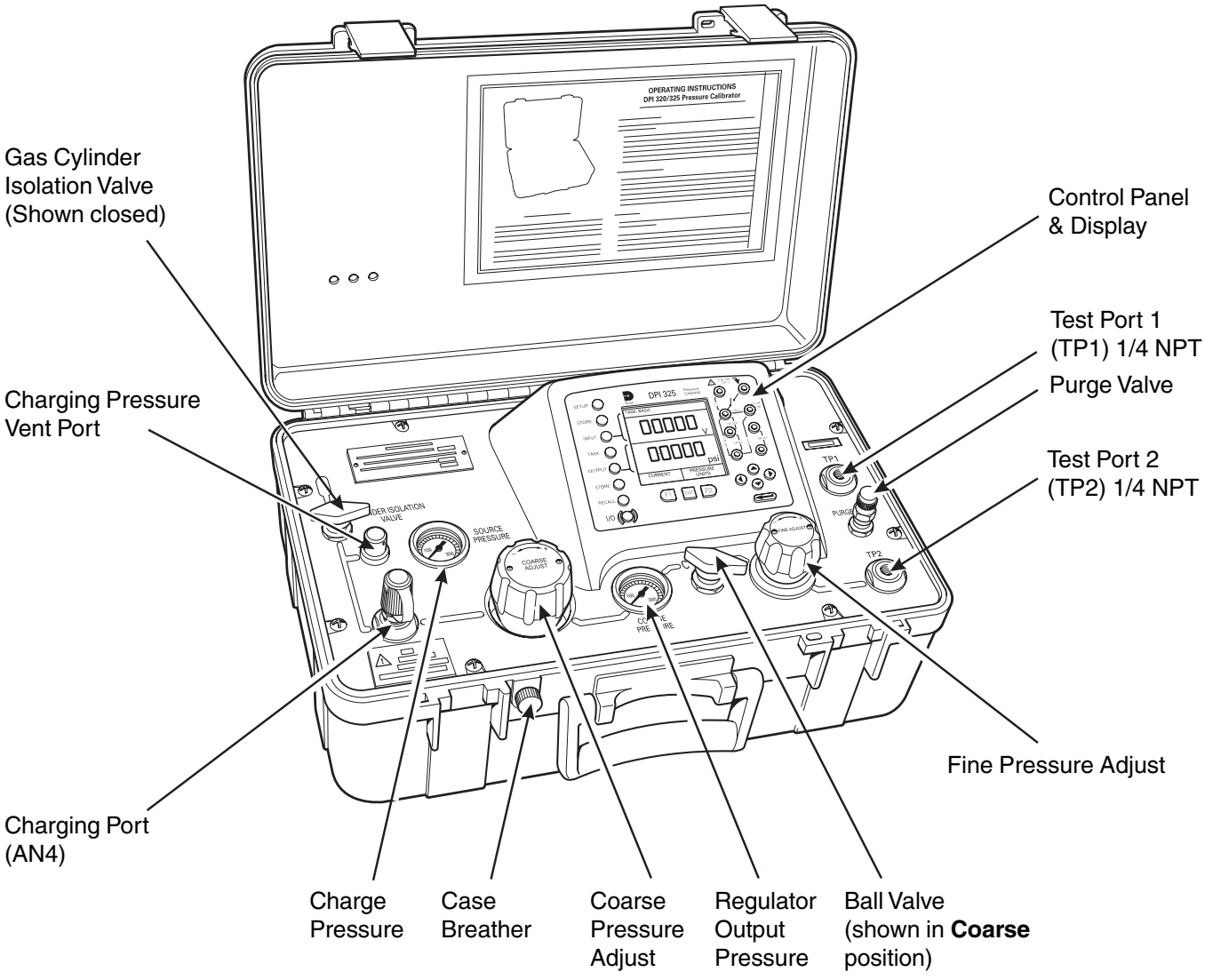


Figure 2-1 - Calibrator Controls

Summary of Functions

CALIBRATOR CONTROL PANEL (Figure 2-2)

The operator controls and a typical display, common to all instrument versions of the series (DPI 320 and DPI 325), is shown below (e.g.),

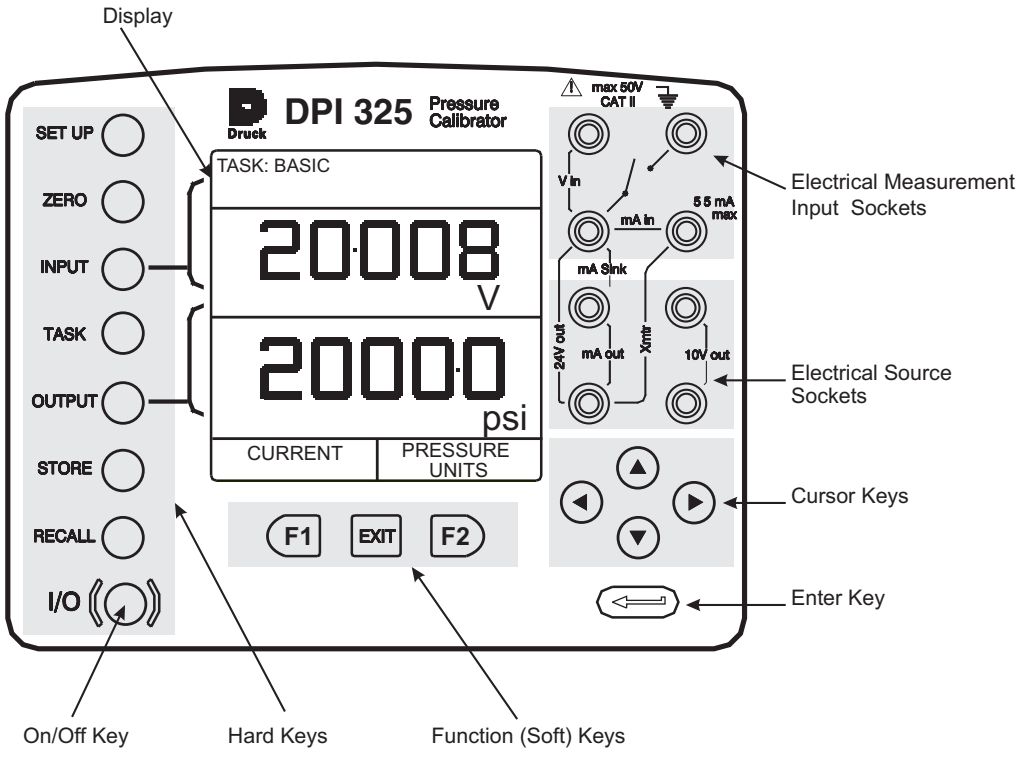
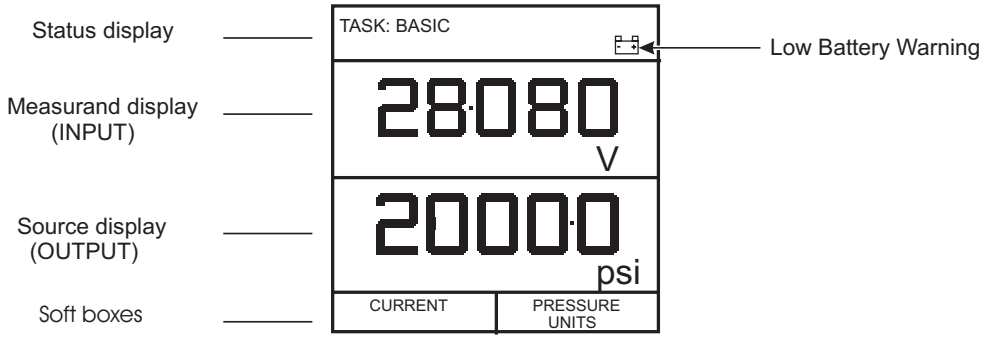


Figure 2-2 - Typical Control Panel (DPI 325 shown)

DISPLAY

The instrument display basically divides into four distinct sections. The two main sections of the display are used to display a *Measurand (input parameter)* and a *Source (output parameter).* The remaining sections are used as a status display area and to define soft key functions. A typical display is shown below (e.g.),



HARD KEY FUNCTIONS (Fig. 2-2)

Key	Function	Ref Page
I/O	This key is used to turn the instrument ON and OFF.	2-6
SETUP*	The **SETUP** key provides access to the instrument's general configuration parameters which are set up to certain default parameters on delivery.	3-34
ZERO	The **ZERO** key can be used to zero either the selected measurand or source display, if the display reading is within 5% of zero. Attempts to zero a larger offset result in an error message, ***Zero too large,***	3-6
INPUT*	The **INPUT** key is used to select which measurand is displayed. Not operational in **BASIC** mode.	3-15
TASK	The **TASK** key is used as a means of rapidly configuring the instrument for a number of different types of external device calibration. There are twenty task configurations available, eleven of which are pre-programmed and nine are user definable.	3-7 to 3-18
OUTPUT*	The **OUTPUT** key is used to select which of the instrument's source outputs is displayed.	3-20 to 3-23
STORE*	Depending upon how the instrument's**STORE** mode is set up, this key is used either to store up to 20 display screens (in **SNAPSHOT** mode), or to manually log a screen in **DATALOG** mode.	3-27, 3-28
RECALL*	This key is used to recall a previously stored screen to the display. Depending on the **STORE** mode set-up, operation of this key recalls either the snapshot of a previously stored screen or DATALOG file. In **STORE** mode, selection displays the last screen stored. By using the cursor keys, the operator can scroll either forward or back through memory locations.	3-29, 3-30
ENTER	The **ENTER** key is used either to enter data (accept entered data), or, in conjunction with the soft keys, to accept a given selection.	2-2
EXIT	The **EXIT** key operates in conjunction with all the other hard and soft keys to exit from the current screen or menu level, to the level immediately preceding it. To quit completely from any menu level, press **EXIT** until the **MEASURE/SOURCE** screen is displayed.	2-2

Keys denoted with an asterisk are not available in BASIC mode.*

SOFT KEYS (Figure 2-2)

Three soft keys, designated **F1, EXIT** and **F2**, are situated immediately below the display as shown in Figure 2-2. These keys have their function allocated by the instrument software which is indicated in the bottom of the display (Voltage for **F1** and Units for **F2** in this example). They are used to select menu (program) options and are fully described under the appropriate section headings.

CURSOR KEYS (Figure 2-2)

The cursor keys consist of a block of four keys, arranged as shown in Figure 2-2. They are designated **Up** (⋏), **Down** (⋎), **Left** (≺) and **Right** (≻). In programs where options need to be selected from a list, (e.g.) the **TASK** selection program, the **Up** and **Down** cursor keys are used to highlight one of the options, from which it can be selected by the **ENTER** key. In **TASK** mode, where more than one page of options are provided, the **Left** (≺) and **Right** (≻) cursor keys will switch between pages.

Summary of Functions

Electrical Inputs and Outputs (Figure 2-3)

Electrical measurement inputs and *Source* Outputs are made via the control panel sockets as shown below.

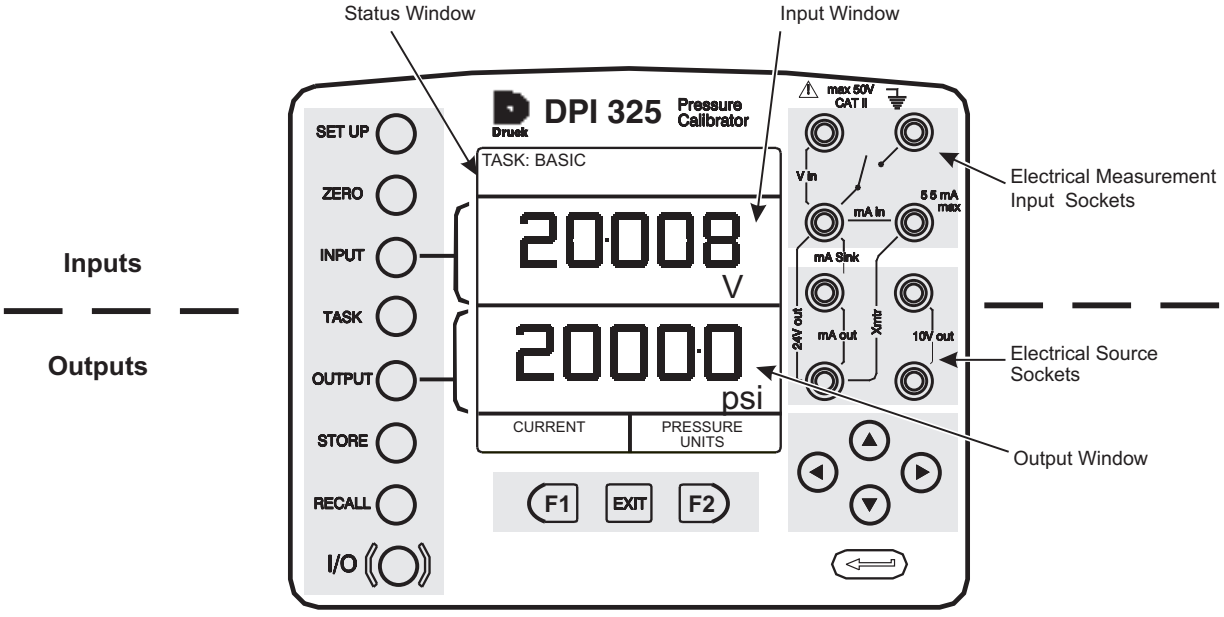
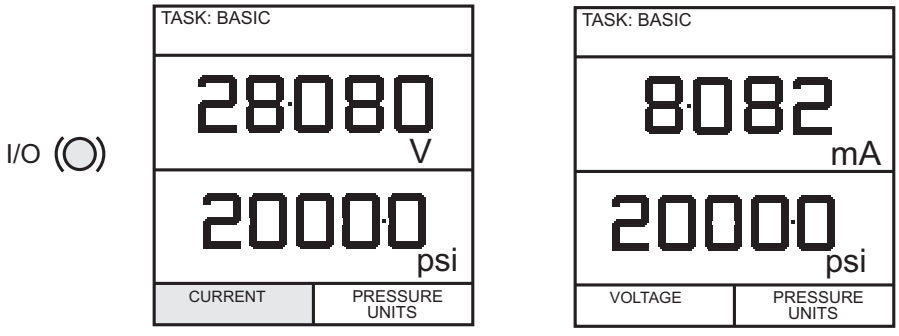


Figure 2-3 - Electrical Measurement Inputs/Source Outputs

Switching On

Press the **I/O** switch on the front panel and proceed as follows.



The first time that the instrument is powered up, following the initialization and Max Pressure screens, it will power up in **BASIC** mode with the main screen displaying voltage in the measurand display area and pressure in the source display area. To switch to ***Current*** as measurand, press **F1** as shown. Similarly, **F1** to return to ***Voltage***.

Note:

No other keys are active in this mode and the instrument can only be reconfigured by pressing the ***TASK*** *key and selecting another mode.*

Initially, the battery pack may not be fully charged and a l**ow battery** indication could be displayed in the top right hand corner of the display. Fit the battery power adaptor/ charger unit to the **DC INPUT** terminal as shown in Figure 2-4 and allow the battery to charge.

ELECTRICAL CONNECTIONS

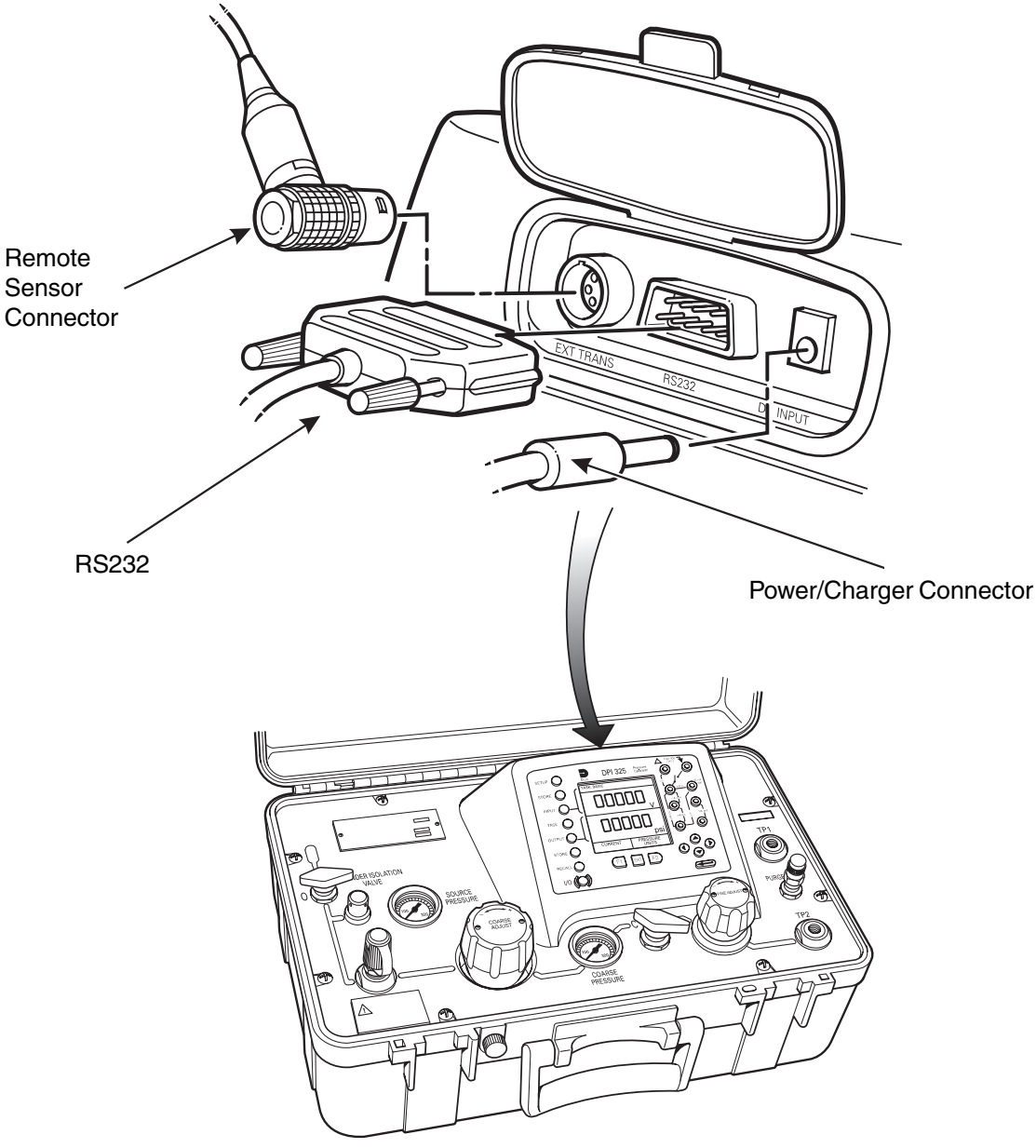


Figure 2-4 - Electrical System Connections

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Operation

WARNINGS

1. **Before applying pressure, make sure all connections are correct and equipment is internally clean and free from damage.**
2. **Make sure that all equipment is to the correct pressure rating.**
3. **Do not exceed the maximum operating pressure stated in the specification.**
4. **Observe the relevant health and safety precautions.**
5. **If a pressure source is connected, this must not exceed the maximum pressure of the calibrator. There is no over-pressure protection between the test port and the internal transducer.**

Cautions

- Only fit appropriate seals on connections.
- Observe absolute cleanliness when using this unit. Damage can be caused if equipment connected to this unit is contaminated. Avoid particulate contamination.

Supply Status

Initially, this equipment is supplied with the gas cylinder empty and the cylinder isolation valve set to CLOSED (cylinder isolated). A captive dust cap is fitted to the gas cylinder charging port and a 1/4 NPT plug is fitted into each of the output ports.

Both the charge and output pressure gauges should therefore be reading zero.

Charging The Internal Pressure Bottle

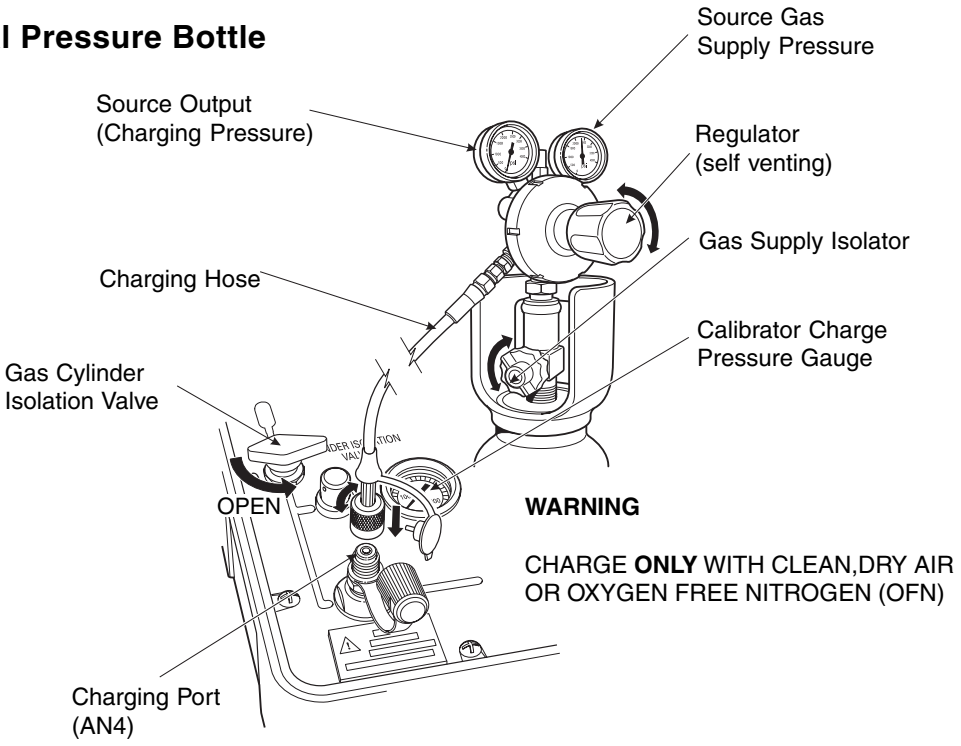


Figure 3-1 Calibrator Gas Cylinder Charging

WARNING: UNLESS A SELF VENTING REGULATOR IS FITTED TO THE SUPPLY SOURCE, SOURCE PRESSURE WILL BE TRAPPED IN CHARGING HOSE. TAKE EXTREME CARE WHEN RELEASING COUPLING AFTER CHARGING.

Method

- Turn the **Coarse** Adjust knob on the calibrator fully counter clockwise.
- Ensure that the Gas Cylinder Isolation Valve is open (turned fully counter clockwise).
- Fit a charging adapter hose to a high pressure Air or Oxygen Free Nitrogen supply regulator as shown above. Ensure that the gas supply regulator is turned OFF (turned fully clockwise).
- Remove the charging port dustcap and connect the free end of the charging hose to the charging port (AN4) and fully tighten the coupling.
- Ensure that the gas supply isolator valve on the pressure source is open (fully counter clockwise).
- Slowly open the regulator valve on the pressure source and allow the cylinder to charge. MAXIMUM CHARGE PRESSURE is indicated on the charging port label. The gas cylinder charge pressure will be indicated on the calibrator's charge pressure gauge.
- Close the source pressure regulator (turn fully clockwise).
- **REFER TO WARNING ABOVE. Carefully** unscrew and remove the charging adaptor from the filling port and refit the dust cap.
- BEFORE USE, ALLOW AT LEAST 30 MINUTES AFTER CHARGING FOR THE CALIBRATOR TEMPERATURE TO STABILIZE .

Discharging The Internal Gas Cylinder

WARNING - THIS PROCEDURE SHOULD NOT BE CARRIED OUT IN A CONFINED SPACE.

- Turn the **Coarse** Pressure Regulator control on the calibrator fully counter clockwise and set the ball valve to the **Coarse** position.
- Remove a blanking plug from one of the test ports and connect the port to a suitable discharge point. Slowly turn the **Coarse** Pressure Adjust regulator clockwise.
- Allow the gas cylinder to discharge. This may take some time, depending upon the residual charge in the cylinder. Fully open the pressure regulator at the end point to ensure complete discharge. When empty, as indicated by the charge pressure gauge, close the regulator and refit the blanking plug(s) to the test port(s).

Charging The Internal Battery

Initially, the internal battery pack may not be fully charged and could give rise to a **battery low** indication. To charge the battery, fit the power adapter/charger unit. The battery charging /external power connector is situated as shown in Figure 3-2 below.

Approximately 14 hours are required to completely charge a discharged battery. A fully charged battery will provide approximately 20 hours of continuous operation.

To prevent the battery from developing a partial charge memory, it is recommended that it be allowed to fully discharge before recharging. A battery capacity indicator is provided under the setup menu.

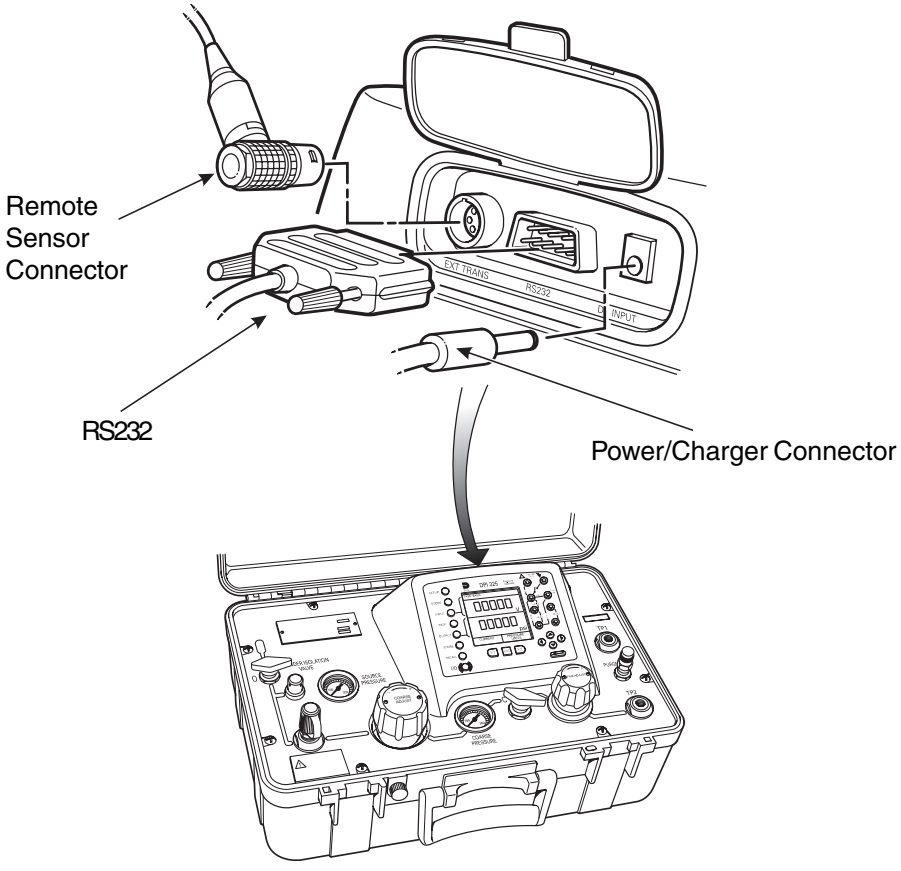
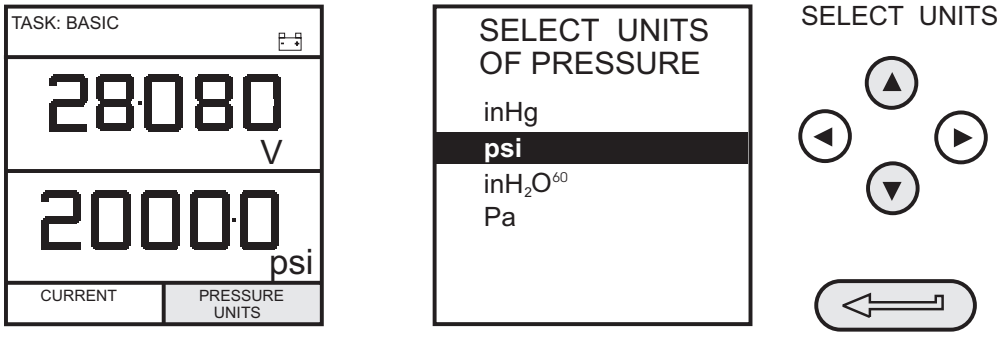


Figure 3-2 Calibrator Battery Charging Connection

Getting Started

Change Pressure Units

To change the pressure units proceed as follows. If the four units displayed are not the units required, press **TASK** and select any task, other than **BASIC**, press **SETUP** and proceed as detailed on page 3-36. To return to **BASIC** mode, press **TASK** and select **BASIC**.



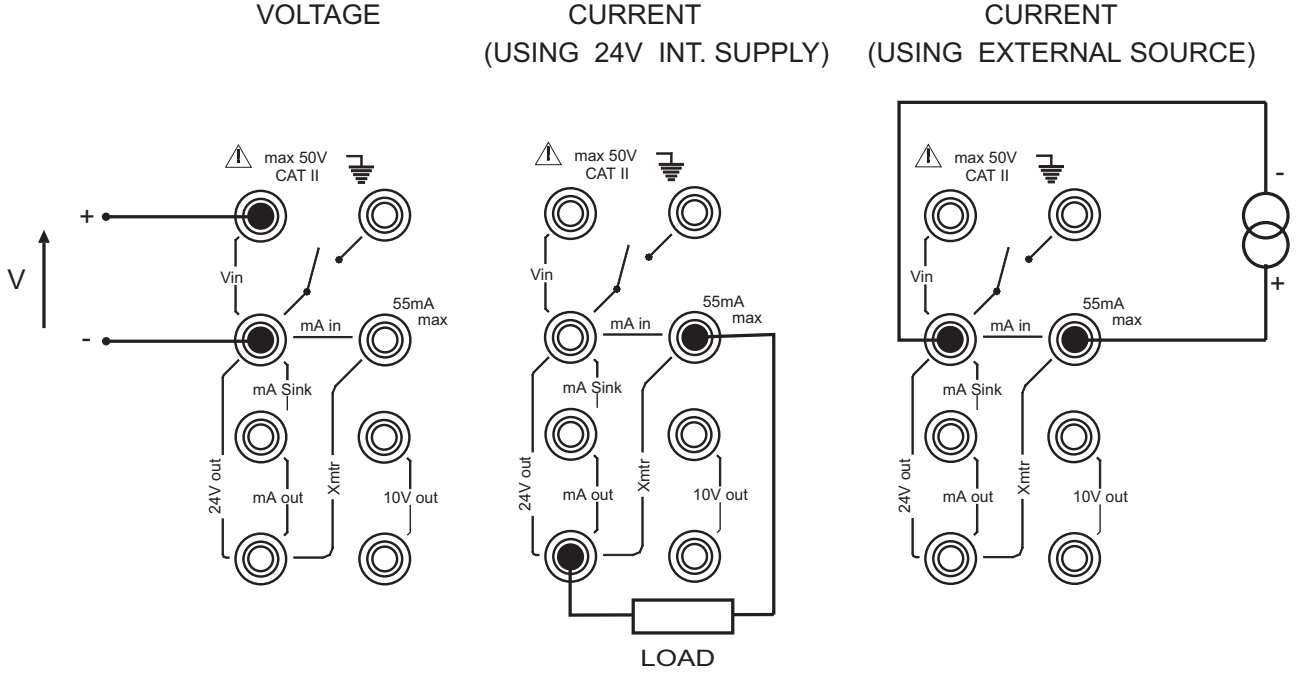
In **BASIC** mode, the unit is configured to carry out basic Pressure to Voltage (**P** to **V)** or Pressure to Current (**P** to **I**) tests a typical test procedures follow.

Voltage and Current Measurements

Connect the electrical input sockets as follows for voltage and current measurements. Use the test leads provided and **DO NOT** push bare wires into the sockets.

Note:

Max applied voltage = 50V dc, Max current = 55mA dc



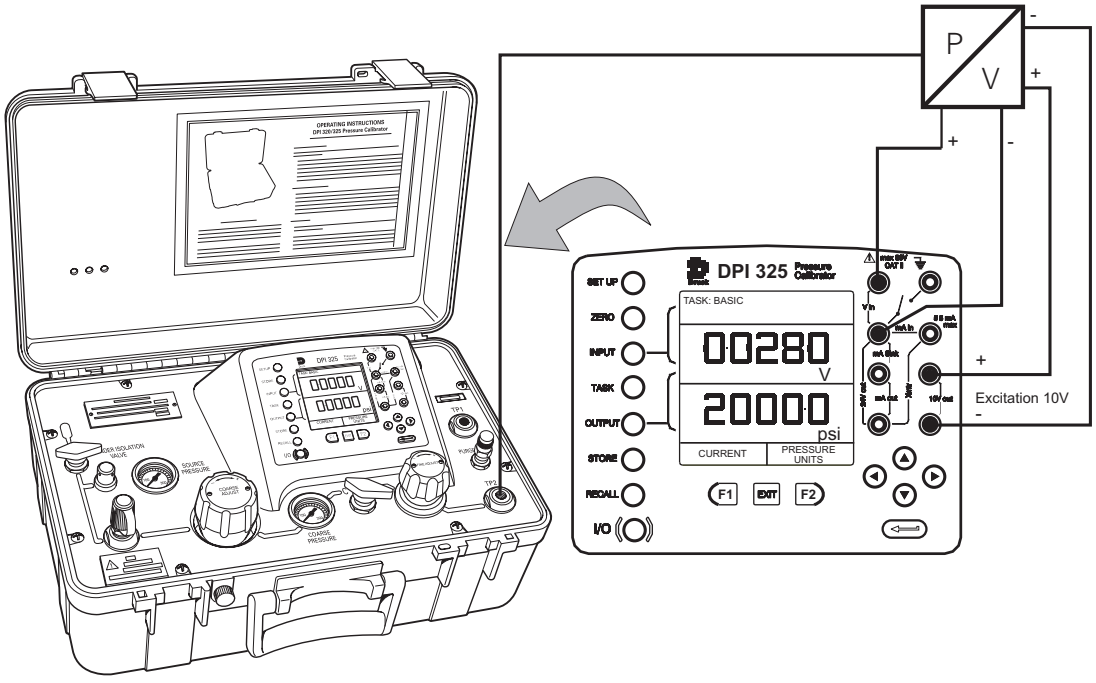
Note:

Max applied voltage for external loop supply = 30V dc

Getting Started

Typical Calibration Setup (Pressure to Voltage)

Connect a unit under test to the instrument as shown below.



Generating Pressure - General Procedure (See also Figure 2-1)

The following general test procedure applies to all tests carried out with DPI 320 or DPI 325 calibrators.

WARNING: APPROPRIATE CARE MUST BE EXERCISED WHEN HANDLING HIGH PRESSURE PNEUMATIC EQUIPMENT.

1. Check the Charge Pressure Gauge to ensure that the calibrator's internal gas cylinder contains sufficient internal charge to carry out the required test. If necessary, recharge as detailed on Page 3-2.

2. Ensure that the **Coarse** pressure regulator is off (fully counter clockwise). Set the ball valve to Fine (fully clockwise), the volume adjuster to mid position and the purge valve to OPEN.

3. Remove the plug from the required output port and connect the unit or system under test to the test port. Check that the plug in the unused test port is fully tightened.

4. Using the leads provided, make all the required electrical connections (e.g.) as shown above for a Pressure to Voltage (P to V) test.

5. Switch the calibrator ON (see Page 2-4).

6. Close the purge valve and Zero the display reading as detailed on Page 3-6. The calibrator and the connected system are now purged and the calibrator is ready to apply pressure to the unit or external system under test.

7. Set the ball valve to **Coarse** (fully counter clockwise). Slowly open the **Coarse** pressure regulator to apply approximately the first required test pressure to the unit or system under test.

8. Switch the ball valve to **Fine** (fully clockwise) and, using the **Fine** volume adjuster, set the output pressure to exactly the required value. Allow sufficient time for the output pressure to stabilize and retrim output pressure, if necessary, before taking readings.

9. Record the pressure and electrical readings at each test pressure. Use the STORE or DATALOG facilities for recording display readings (pages 3-28 to 3-31).

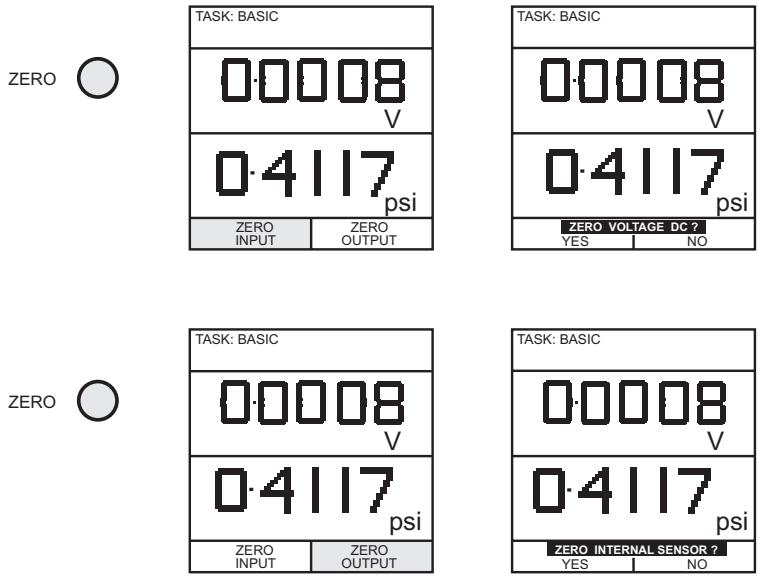
10. Repeat steps 7 and 8 to set up any additional test pressures required. Recommended test pressures are Zero, 10%, 25%, 50%, 75% full scale on an ascending run, followed by 75%, 50%, 25%, 10% and zero on a descending run.

11. When testing is completed, back off the output pressure to zero. Initially, this may be done with the volume adjuster and then by switching the ball valve to **Coarse** and setting the **Coarse** pressure to zero (fully counter clockwise). If the UUT is likely to contain any condensate or residual fluid it is recommended that the purge valve be used to release any residual pressure trapped in the output manifold.

12. Disconnect the unit or system under test.

Zero Display Reading

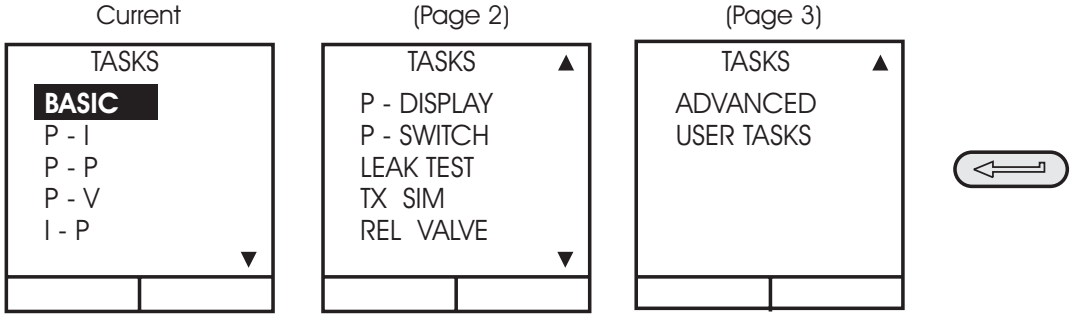
Both the input and output windows can be set to zero by operation of the **ZERO** key, providing that the displayed reading is already within 5% of zero. To zero either the ***INPUT*** (Measurand) or ***OUTPUT*** (Source) windows, proceed as follows (e.g.),



Task Selection

Task Key

The TASK key is used to set up the instrument for a number of specific types of test. There are two modes BASIC and ADVANCED and nine other specific types of test which automatically configure the instrument on selection from the TASKS menu. The tasks available under the TASK menu are held on three pages shown below. To select a task from the menu, press the TASKS key, position the cursor over the desired task and press the ENTER key as shown below. Use the right/left cursor keys to switch between pages.

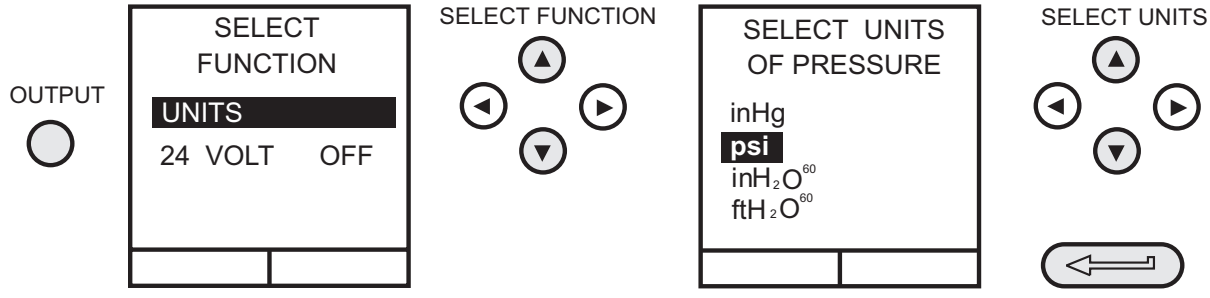


Using TASK Functions

Specific tasks are selected as shown above. The following diagrams show how to connect the unit under test (UUT) for each task selectable under the TASKS menu.

Input and Output units, where applicable can be selected by pressing either the INPUT or OUTPUT keys as shown below. The output key also provides the facility of turning the 24V output supply ON and OFF. When not in use, the 24V supply output should be turned OFF to conserve battery power.

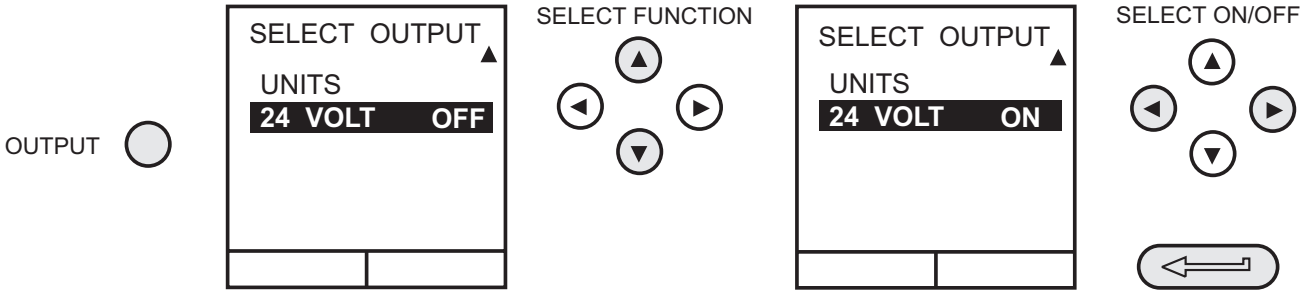
Set Units



Note:

If the four units displayed are not the units required, press SETUP, select SETTINGS and refer to Page 3-37.

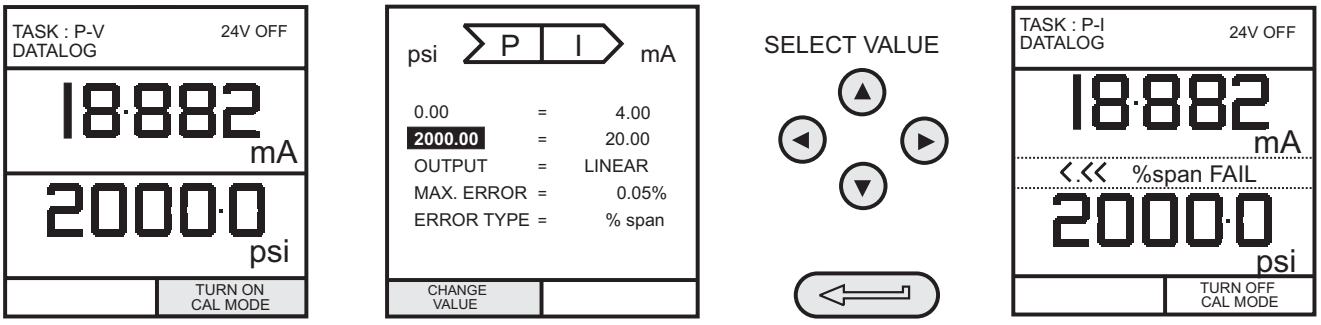
Set 24 Volts



Task Selection

Cal Mode (DPI 325 Models Only)

Cal mode, which is available in tasks P-I, P-P, P-V, P-P, P-DISPLAY and P-SWITCH, provides a method of setting up test parameters manually. Downloaded test procedures can also automatically set up and turn on the Cal Mode function. The method of turning on and setting up Cal Mode is shown below for a P-I task. The method is similar for all the other tasks to which Cal Mode applies.



Pressing the F2 key (TURN ON CAL MODE), provides the set up screen for the CAL mode. Initially, the cursor is placed in the UUT SPAN field to allow the desired span range to be entered. The corresponding values for the DUT output parameter (current) are then set, followed by the maximum error value and error type (%Rdg or %Span). When all test parameters have been set up, the screen changes to display the input and output and the test results. The test result can only be displayed to within a range of ±9.99%. If the test result is outside this range, either the left pointing (-ve error) or right pointing (+ve error) chevrons are displayed. Within this error band, the actual tolerance value is displayed. Test results can either be stored as snapshots or logged as datalog files, depending upon how the instrument has been set up.

The method of downloading procedures and uploading data files is described in the section headed Memory Operations, refer to pages 3-30 to 3-31.

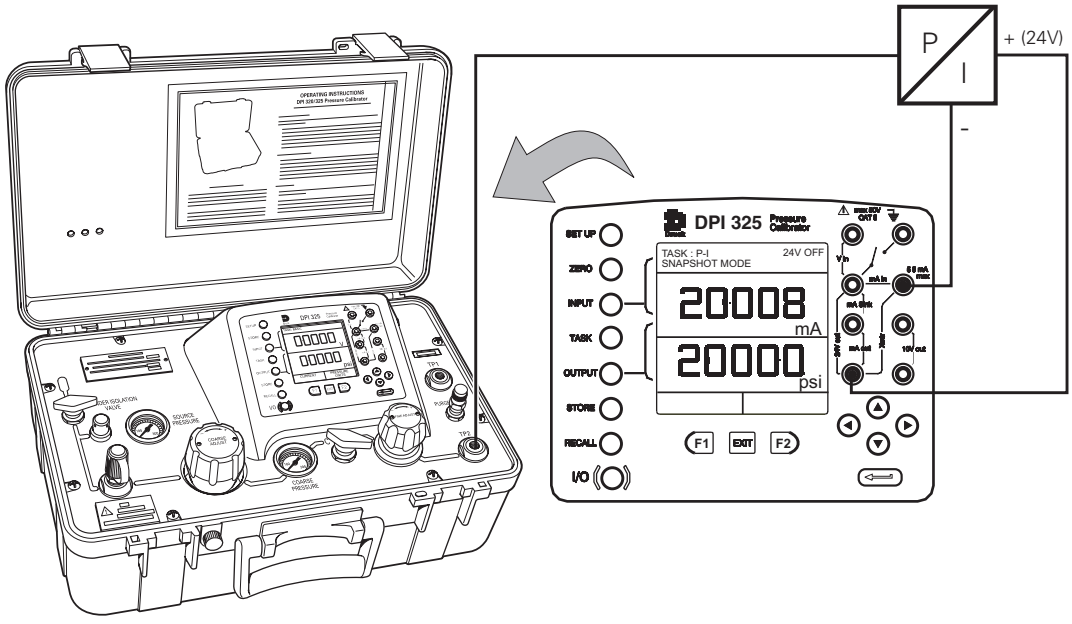
Basic Mode (Task BASIC)

This instrument will power up in this mode the first time that it is used. To select **BASIC** from any other task, press the **TASK** key and select **BASIC** and press the **ENTER** key. **BASIC** mode is fully described in the **Getting Started,** section (see pages 3-4 to 3-6).

Taking Measurements

Pressure Transmitter (P-I) Task

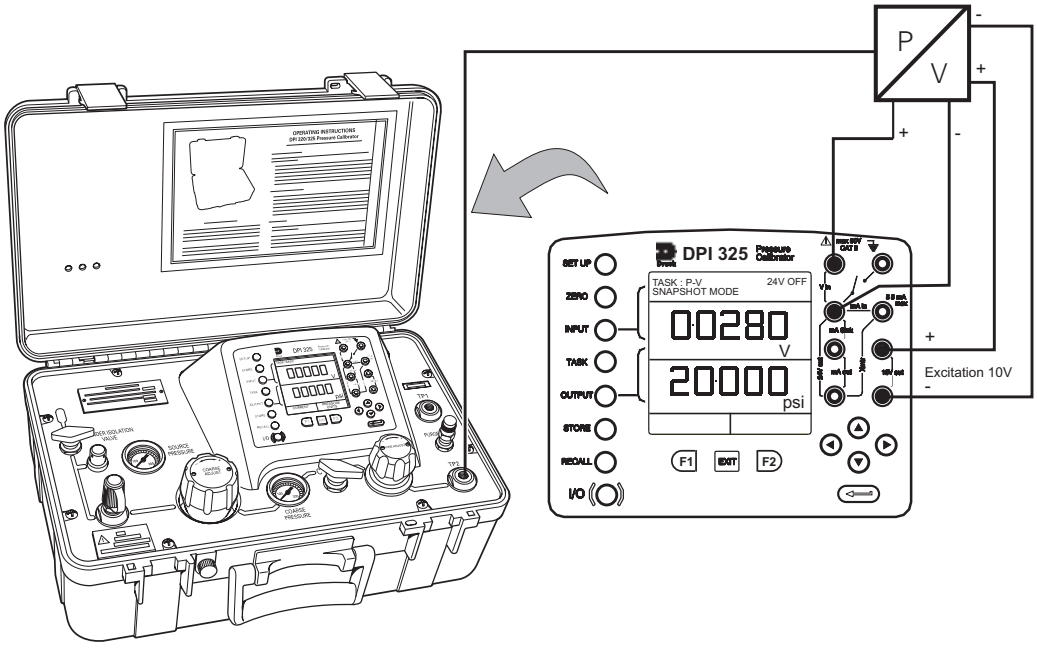
Select the P-I task from the task menu and connect the Unit Under Test (UUT) to the calibrator as shown below.



- ❍ If required, select the output units as described on page 3-7.
- ❍ If required, turn on Cal Mode and set up the test parameters as detailed on page 3-7.

Voltage Output Pressure Transmitter (P-V) Task

Select the P-V task from the task menu and connect the Unit Under Test (UUT) to the calibrator as shown below. Voltage output transducers with a 10 volt supply and outputs of ±50V can be calibrated. Use the 10V output sockets to supply the transducer and connect its output to the voltmeter. The test method is similar to that shown above



Pressure Converter (Pressure to Pressure) Task

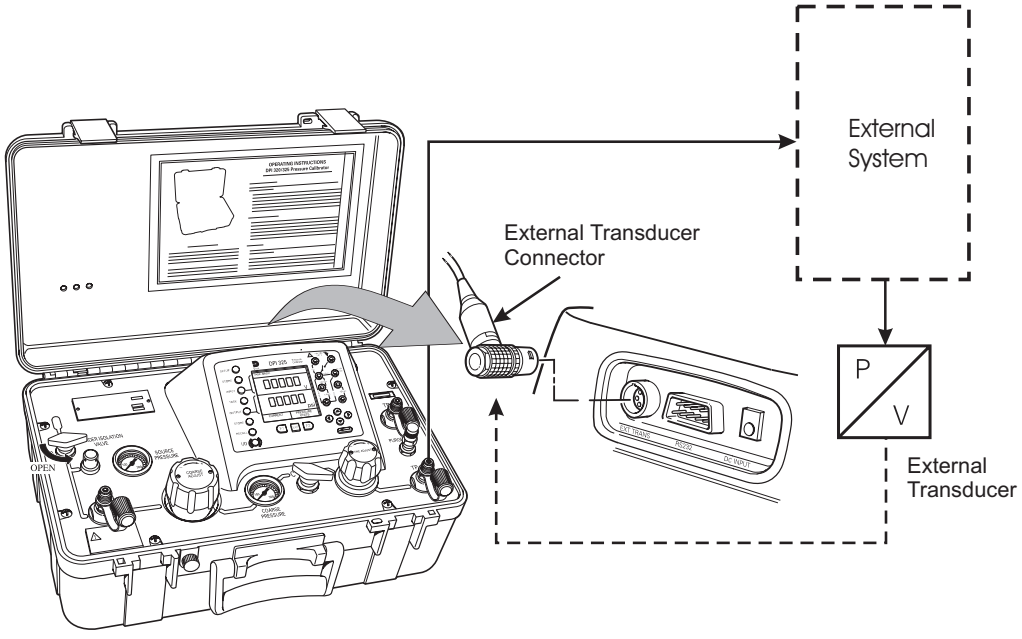
Select the P-P task from the task menu and connect the Unit Under Test (UUT) to the calibrator as shown below. Testing a converter requires one pressure to be applied to the unit under test (UUT) and another (converter output) to be measured. The additional measurement is provided by the external transducer option.

Method

❍ Connect the UUT to the calibrator as shown below and plug the external transducer into the calibrator as shown below.

WARNING

DO NOT OVERPRESSURE THE EXTERNAL TRANSDUCER.
THE MAXIMUM WORKING PRESSURE IS MARKED ON THE TRANSDUCER'S BODY



❍ Press the TASK key and select the P-P task. Providing the external transducer has been calibrated and its parameters stored in the instrument, the display will show **External** pressure in the input window and calibrator **Output** pressure in the output window. If an error message "NO SENSOR OR CAL INVALID" is displayed, this indicates that the external transducer has not been entered and/or calibrated with the instrument. Refer to Page 5-3 for details of adding an external transducer. **If an external transducer change is made, switch the calibrator off and then on to load new transducer data.**

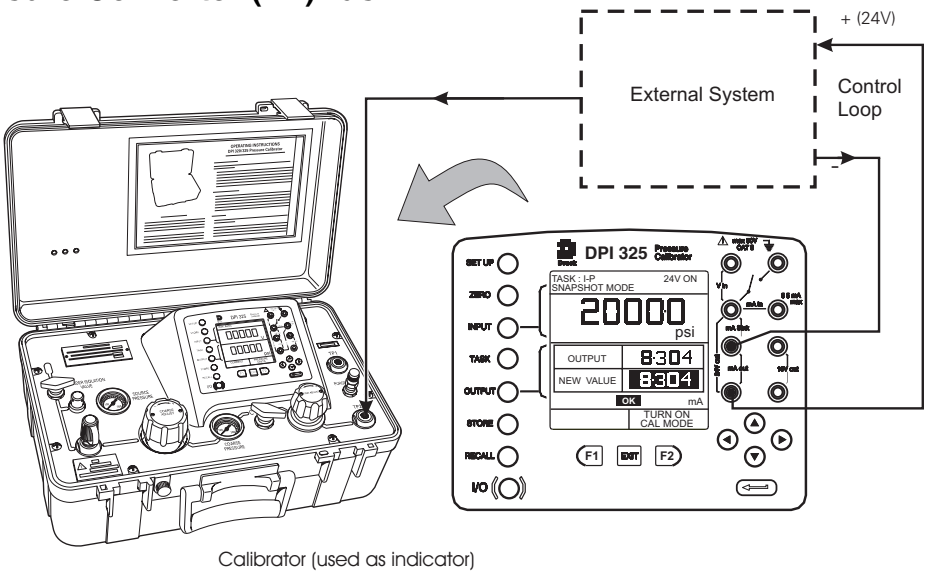
❍ If required, select the input and output units as described on page 3-7.

❍ If required, turn on Cal Mode (DPI 325 models only) and set up the test parameters as detailed on page 3-8.

Note: *Match pressure ranges to give required accuracy and avoid overpressure. If external pressure is required as the output and internal pressure the input, use ADVANCED mode for this setup.*

Taking Measurements

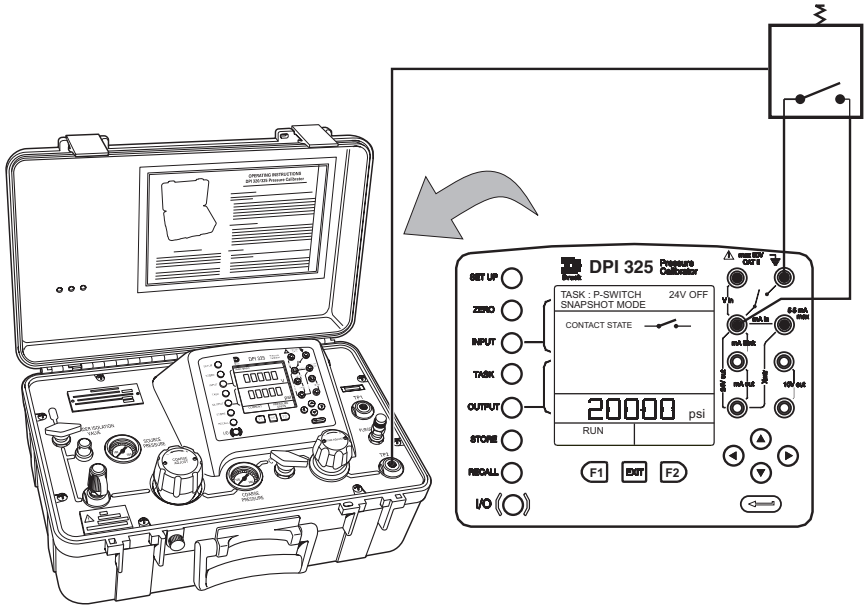
Current to Pressure Converter (I-P) Task



Calibrator (used as indicator)
Ball Valve set to Fine

- Use the **Up** (⮝)and **Down** (⮟) cursor keys to adjust the loop current to the required value. Alternatively, press ENTER and use cursor keys to enter a finite value. Cursor keys can then be used to nudge the output either up or down. If required, change pressure units with the INPUT key.

Pressure Switch Tests (P-SWITCH) Task



- Press the **TASK** key and select **P-Switch.**
- Connect pressure switch under test to DPI 320/325 as shown above.
- Contact state will be shown on display. When contacts close, buzzer sounds.
- To run switch test, close vent valve and press the ***RUN*** (F1) key.

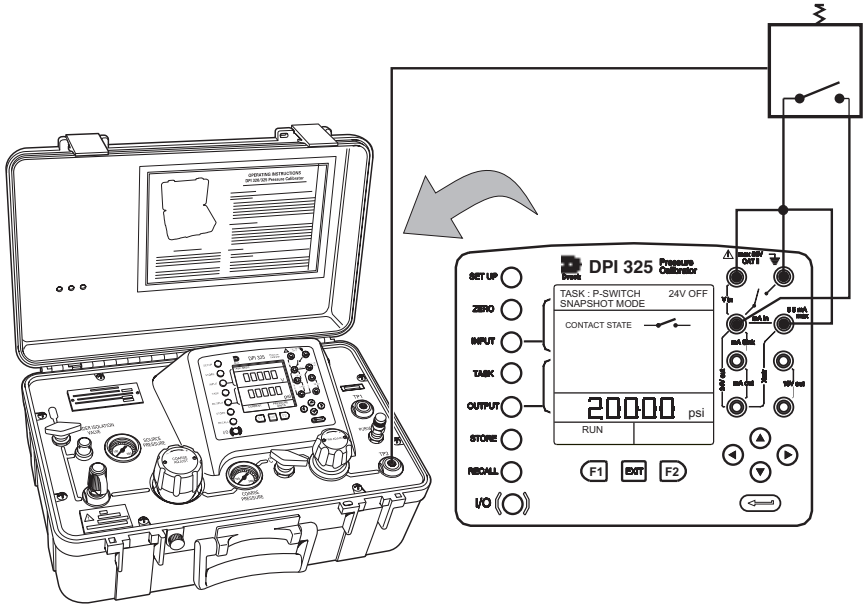
Taking Measurements

- ❍ Using the Coarse pressure control, increase the applied pressure to just below the switch operating point. Set the ball valve to **Fine** and slowly screw the volume adjuster in until the switch operates (the operating pressure of the switch is then written to the display).

- ❍ Reduce pressure with volume adjuster until the switch releases (indicated by the switch symbol). The release pressure is then written to the display and the hysteresis value displayed.

TASK: P-SWITCH SNAPSHOT MODE		24V OFF
CONTACT STATE		
CLOSED AT	303.82	psi
OPENED AT	206.67	psi
HYSTERESIS	96.15	psi
	200.00	psi
RUN		

Pressure Switch Test with Contact Resistance Measurement



Press the **TASK** key and select **P-Switch.**

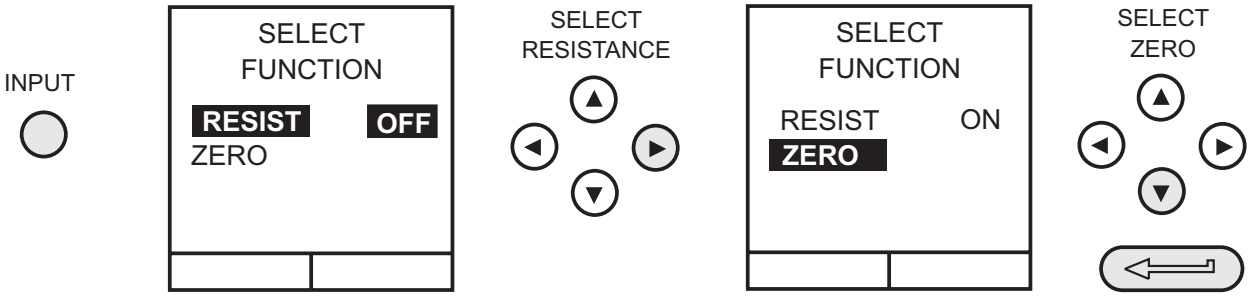
- ❍ Connect test leads to DPI 320/325 as shown above. Initially, do not connect to the pressure switch.

- ❍ Contact state will be shown on display. During test, when the switch contacts close, a buzzer sounds.

Taking Measurements

Pressure Switch Test with Contact Resistance Measurement (Contd.)

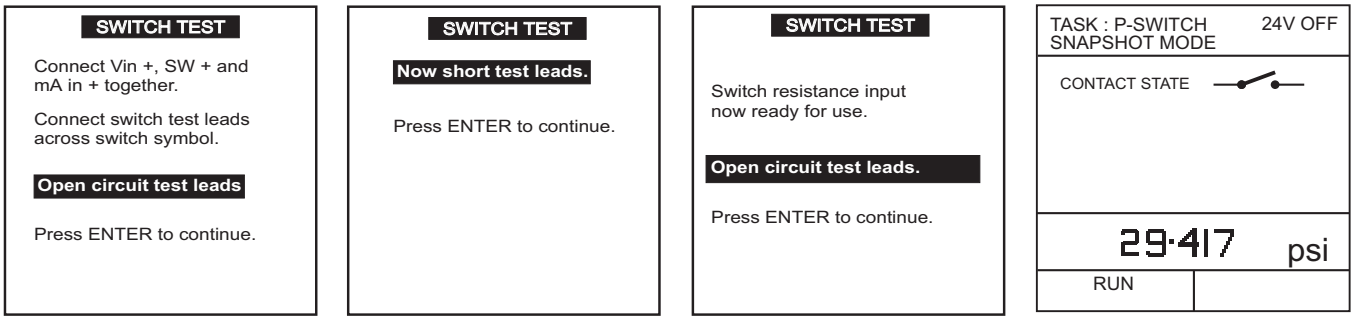
❍ Press the INPUT key and proceed as follows.



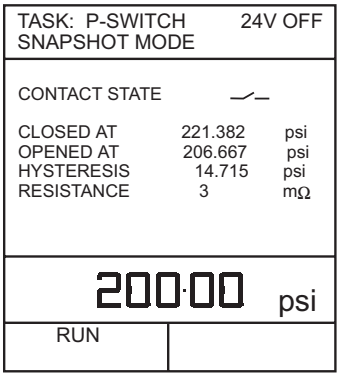
To ensure accurate measurements it is recommended that the zero procedure (which compensates for the resistance of the leads), is carried out before performing the test.

Note:

Allow sufficient time between contact closure for resistance measurement to stabilize.



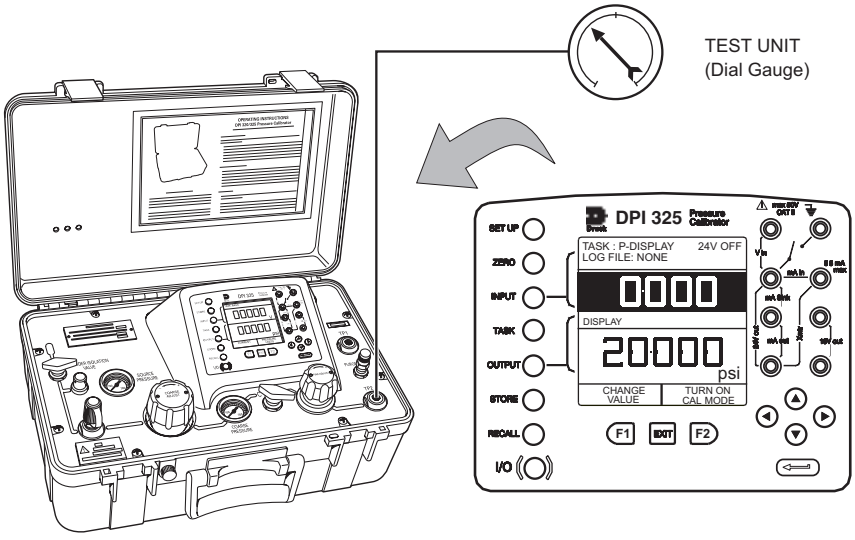
The switch test is performed in the same way as the previous section, except that the contact resistance is measured and displayed together with the results.



Taking Measurements

Pressure to Display (P-DISPLAY) Task

P-Display is a special application of Datalog. To use this mode, select Data Log from the Store Mode menu as detailed on page 3-35. Connect the unit under test to the instrument as shown below and, if required, turn on and setup Cal Mode, if applicable, (See page 3-8).

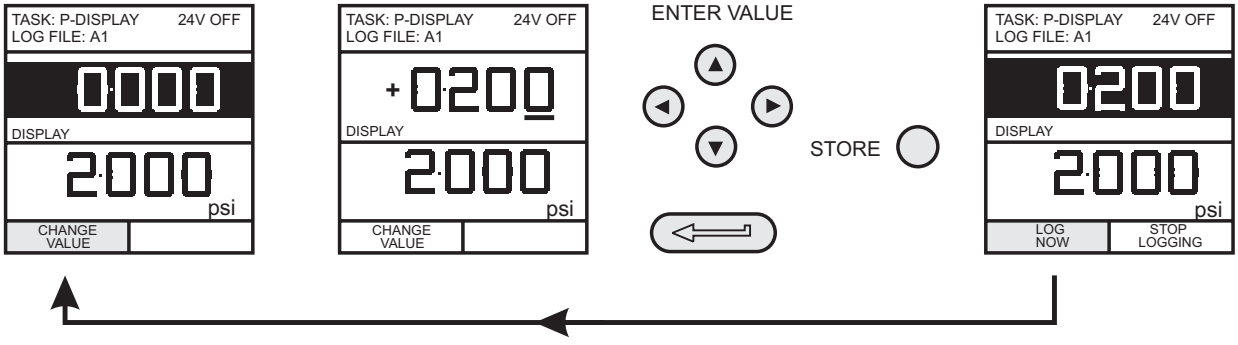


- Press **TASK** and select ***P-DISPLAY***. *If required, use* **OUTPUT** *key to change pressure units.*
- Set up a Data Log file as detailed on page 3-29.

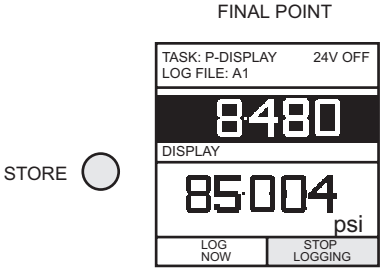
Note:

TRIGGER *field, automatically set to* ***KEYPRESS****, cannot be changed.*

- Apply a series of test pressures to the unit under test. Enter displayed reading at each pressure and log each point (e.g.),

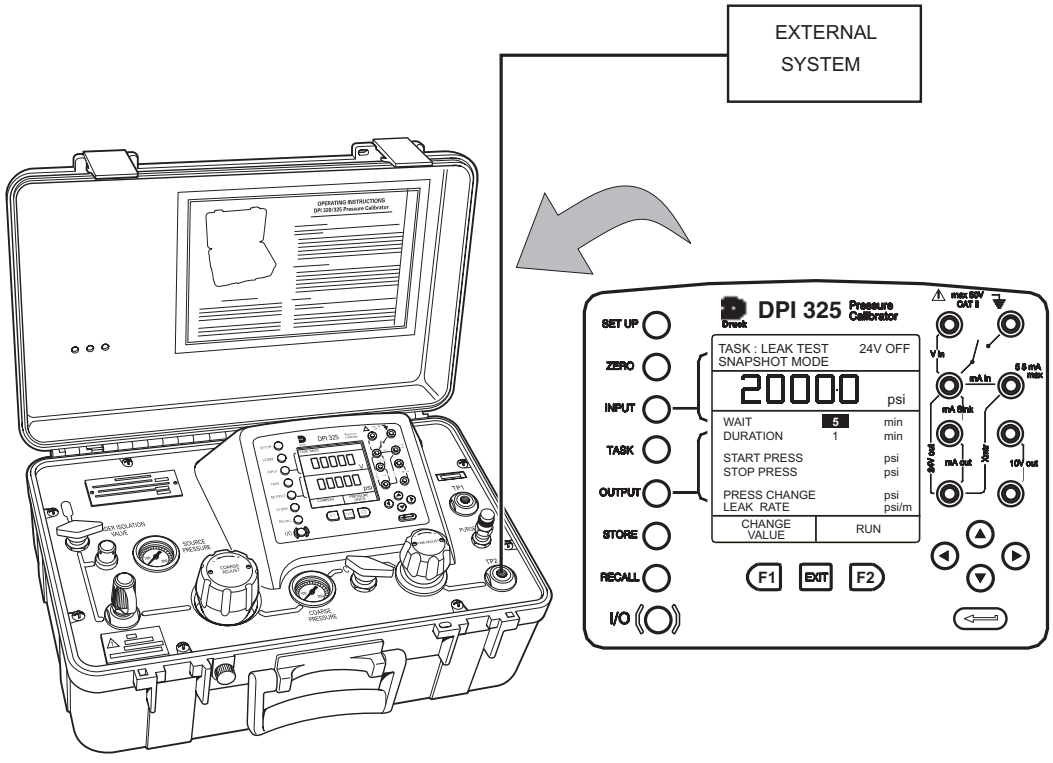


- After logging final test point, terminate as follows (e.g.),

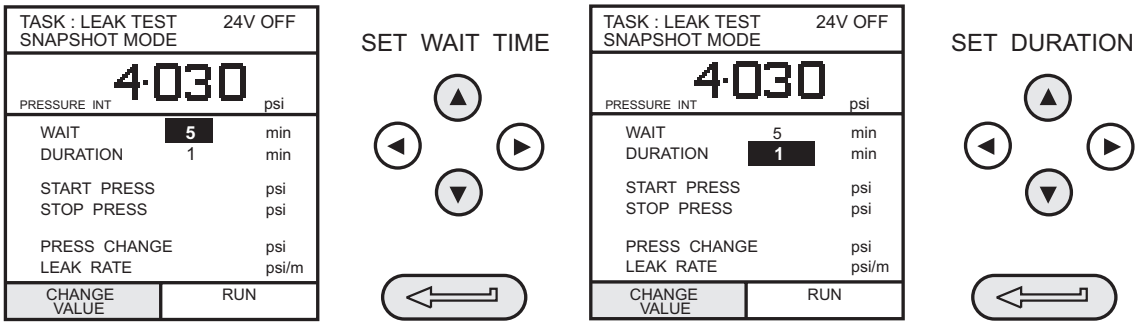


Taking Measurements

Leak Test (LEAK TEST) Task



- If required, use the **INPUT** key to change the pressure units.
- Set up the leak test WAIT and DURATION times to the required values as shown below. A minimum wait period of 5 minutes is recommended.

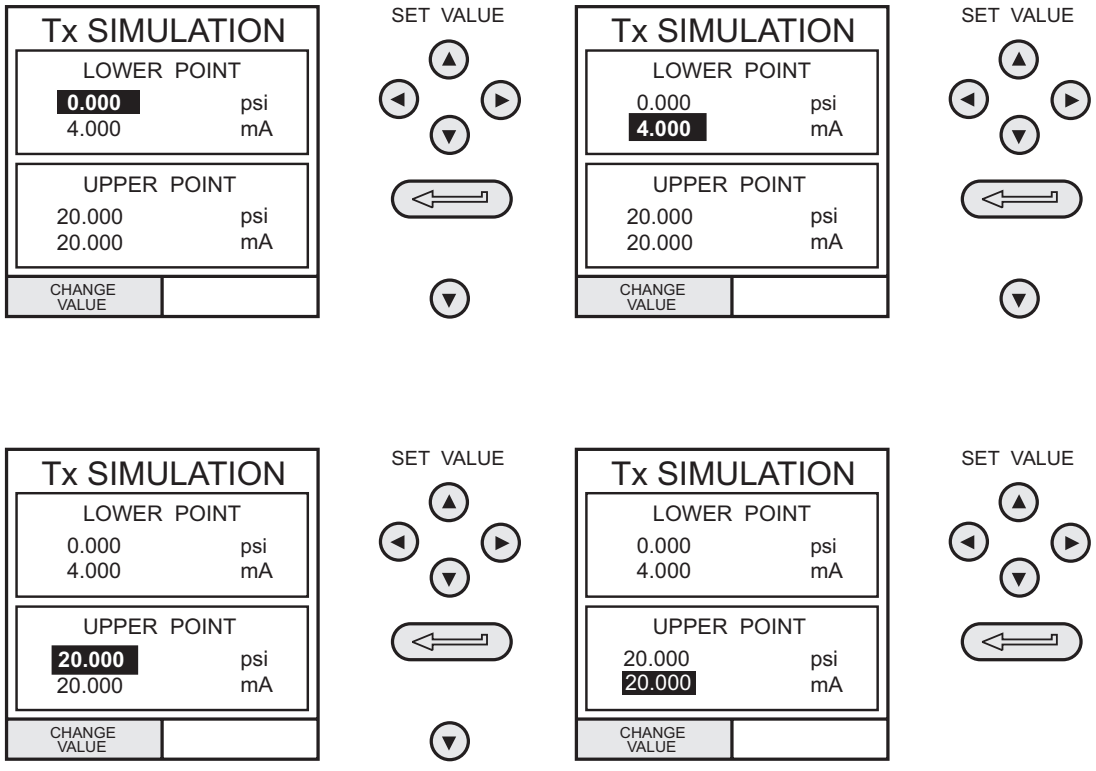


- Use the Coarse and Fine controls to pressurize the external system to the required ***LEAK TEST*** pressure.
- Press the ***RUN*** **(F2)** key to start the leak test. When completed, the beeper sounds and the leak test results are written to the display.

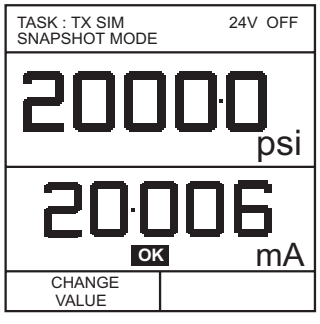
Taking Measurements

Transmitter Simulator (TX SIM) Task

Provides a current output proportional to the calibrator's measured output pressure. Select task **TX SIM.** Press **EXIT** to skip setup screen if parameters are correct.



On completion of **Tx SIM** setup, the display is configured as follows (e.g.).



Set up the output loop as detailed on page 3-23 and turn on the internal electrical supply if required.

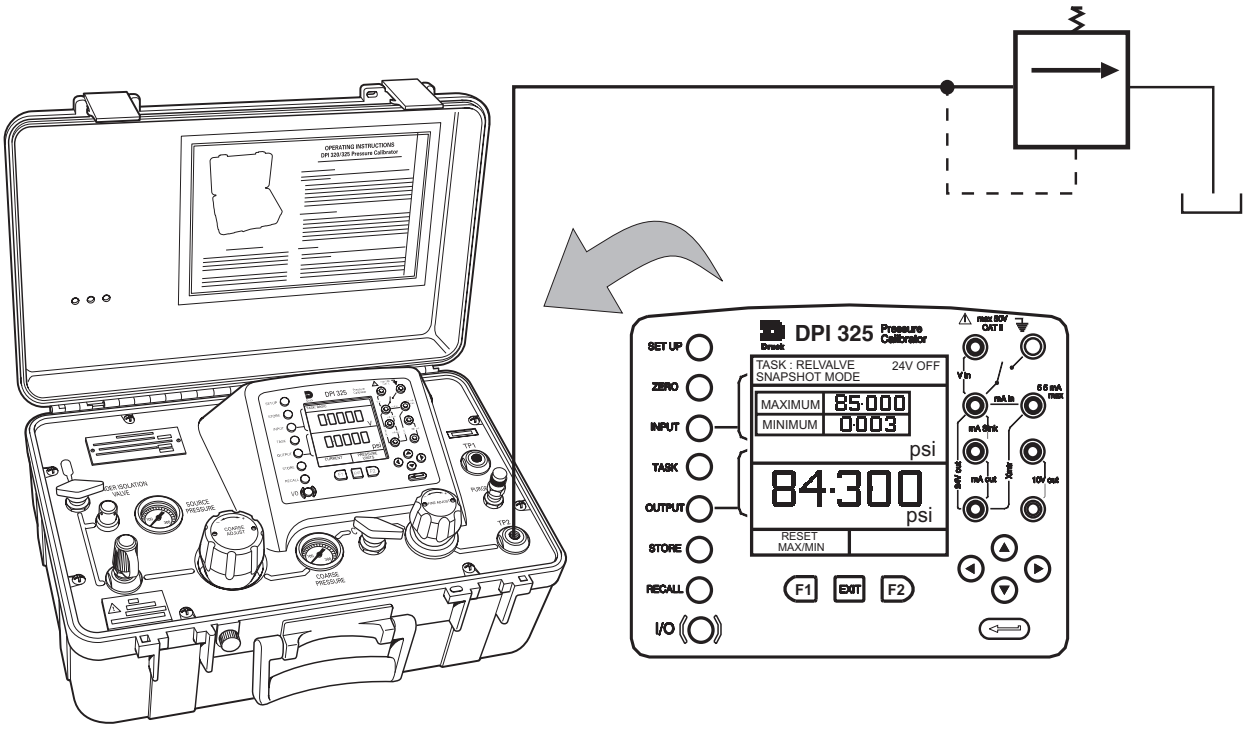
To subsequently change any of the **TX SIM** scaling parameters, press **CHANGE VALUE (F1)** to obtain the TX Simulation display.

To change the pressure units, press **INPUT** and select the required scale units. If the required scale units are not listed, press **SETUP**, select ***SETTINGS*** and proceed as detailed on page 3-37.

Taking Measurements

Relief Valve Test (REL VALVE) Task

To carry out a relief valve test, press **TASK** and select **REL VALVE**. Connect the output pressure port of the instrument to an external system as shown below.



- To change the pressure units, if required, press **INPUT** and select the required units by means of the cursor keys.
- To turn on the 24 Volt internal supply, if required, press **OUTPUT**, select **24 VOLT**, switch **ON** with the right cursor button and press **ENTER**.
- Using the Coarse and Fine controls, apply pressure to the relief valve under test.
- When the relief valve operates, the maximum recorded pressure indicates the operating point of the valve.
- Record the test results.

Note:

*The **STORE** key can be used for this purpose. Use right cursor key initially, followed by up/down keys to enter Snapshot text).*

- Back off the **output pressure, initially by using the Fine** volume adjuster. Set the **Coarse** pressure regulator to zero and switch the ball valve to **Coarse.**

Advanced Task

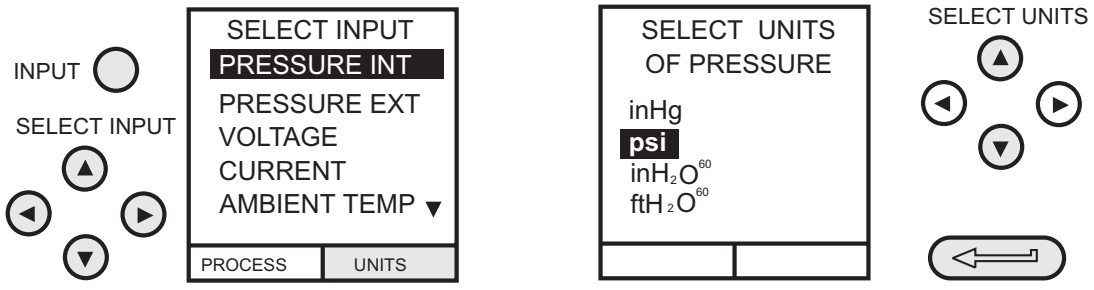
General

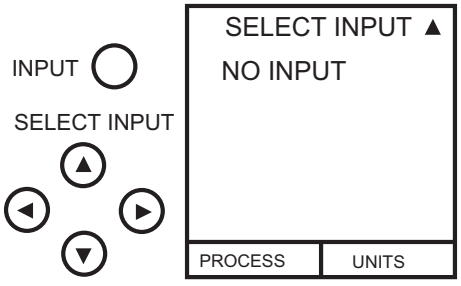
Advanced task allows the user to configure the instrument to monitor one of a number of different input measurands (Inputs) and outputs (Sources). Additionally, five process functions, ***Tare, Max/Min, Filter, Flow*** and ***% Span*** can be applied to the input functions.

Select Input

To select an input channel for display, select **ADVANCED** Task from the task menu and proceed as follows. If, in addition to process functions, a range of units is available for the selected channel, a **UNITS** soft box (actioned by the F2 function key), will be written to the display.

The following procedure shows the method of input channel selection and the method of changing units (e.g.),





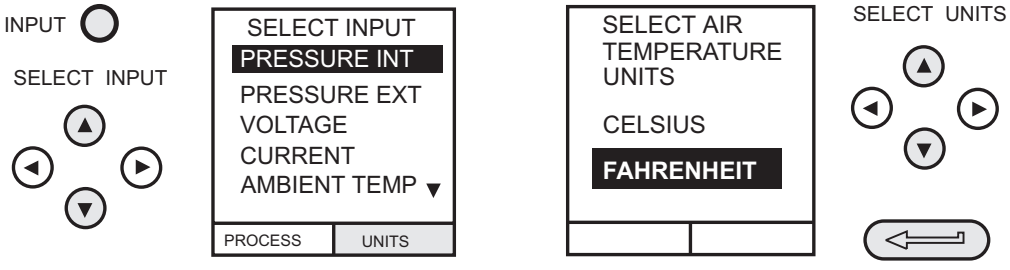
Refer to pages 3-19 to 3-22 for details of process functions.

Note:

Use the Left/right arrow keys function as page up/down keys.

Ambient Temperature Measurement

To set up the instrument to read ambient temperature, proceed as follows (e.g.),



Note:

Up to 1 hour may be required for the temperature reading to stabilize.

Advanced Task

Process Functions

If required, the following process functions are available on the Measurand *(INPUT)* display but **only** in **ADVANCED** task. If the instrument is in any other mode i.e. BASIC or any other task mode, the input and output displays must first be configured in **ADVANCED** task.

Note:

PROCESS functions are not available to the output (SOURCE) channel.

A summary of the process functions follows:

Tare Allows either the current display value or a manually entered value to be tared off display parameter reading.

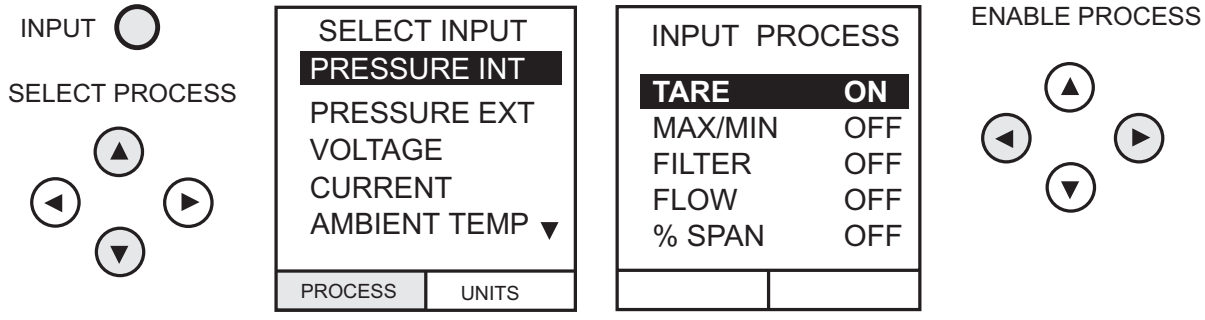
Max/Min Displays running Max/Min and Present display values simultaneously. Resettable via F1 key.

Filter Applies low pass filter function to displayed parameter. Filter characteristics *(Settling time and Band)* are user programmable.

Flow Applies square root function to displayed parameter.

% Span Converts displayed parameter reading to a percentage of span. Span definable via the F1 key.

Following selection of **ADVANCED** from the task menu, press the **INPUT** key. Use the **Up** (▲) or **Down** (▼) cursor keys to select the required input. Press the ***PROCESS*** (F1) key and use the **Left** (◄) or **Right** (►)cursor keys to enable the process on/off (e.g.),



Press **ENTER** to switch the process ON with existing settings or F1 to change process settings (where applicable).

Advanced Task

❍ **Tare Process Function**

To set up a Tare function, enable **TARE** from the process menu and press F1 to enter the Tare **SETTINGS** functions.

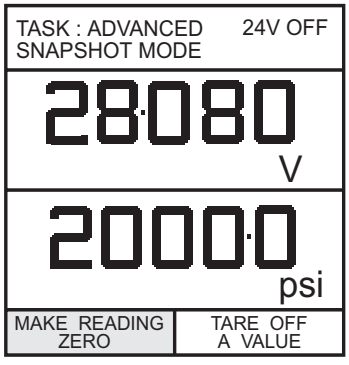
Disable **TARE** by entering process menu and turning the function **OFF.**

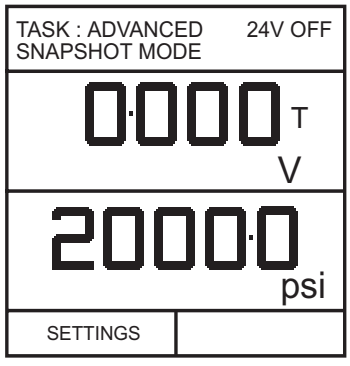
Note:

Last TARE setting is retained and will be applied when function is next enabled.

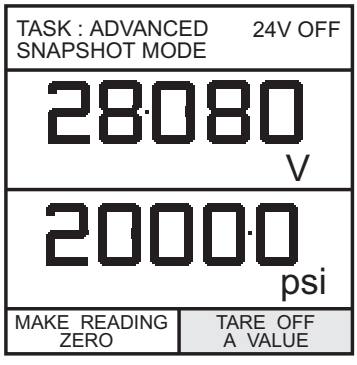
Tare Current Measurand Reading

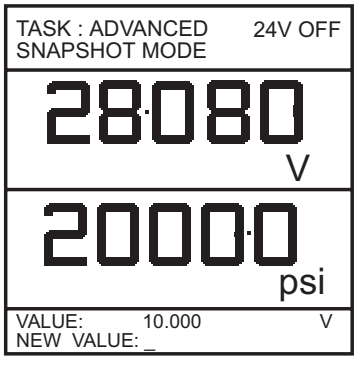
To tare off the current display reading, proceed as follows (e.g.),

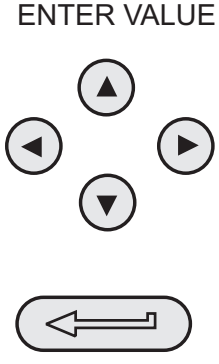




Tare Off An Entered Value To tare off an entered value (e.g.) of voltage, proceed as follows,







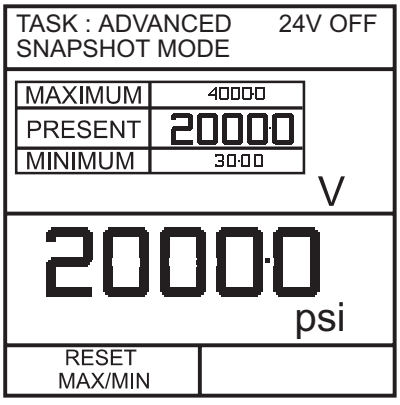
Advanced Task

❍ Min/Max Process Function

To set up an input display to show min/max and present measurand reading, enable MAX/MIN from the process menu and press F1 (SETTINGS) to provide **RESET** function. The display is now reconfigured to show the max/min values as follows (e.g.),

Reset Max/Min display at any time by pressing the F1 key.

To quit max/min, press **INPUT**, select **MAX/MIN** from process menu and switch the function off.

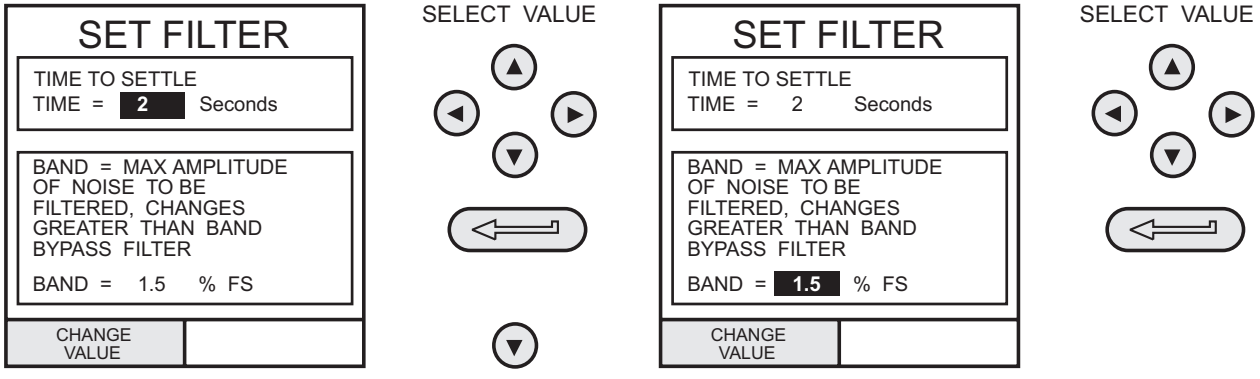


❍ Filter Process Function

To apply the low pass filter to a selected measurand, enable **FILTER** from the process menu and press F1 (SETTINGS) to provide access to the filter parameters. Two settings are required, *Time to Settle* and *Band*.

To examine the current filter settings and exit without change, press the **EXIT** key.

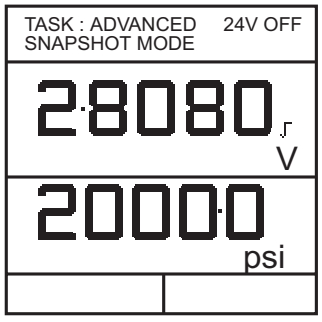
The setup procedure is as follows.


SET FILTER
TIME TO SETTLE
TIME = 2 Seconds
BAND = MAX AMPLITUDE OF NOISE TO BE FILTERED, CHANGES GREATER THAN BAND BYPASS FILTER
BAND = 1.5 % FS
CHANGE VALUE
SELECT VALUE
SET FILTER
TIME TO SETTLE
TIME = 2 Seconds
BAND = MAX AMPLITUDE OF NOISE TO BE FILTERED, CHANGES GREATER THAN BAND BYPASS FILTER
BAND = 1.5 % FS
CHANGE VALUE
SELECT VALUE

Advanced Task

❍ Flow Function

To apply the flow function to a selected measurand, enable **FLOW** from the process menu and press **ENTER**. The square root symbol is displayed beside the measurand to indicate that the **FLOW** function is active (e.g.)



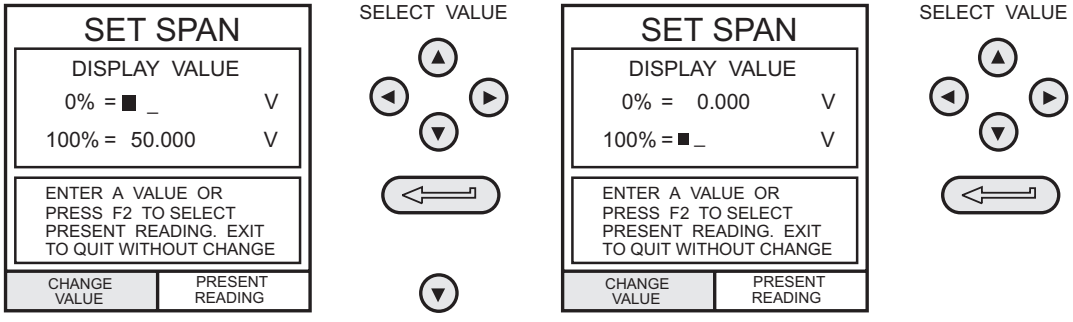
To cancel **FLOW**, press **INPUT** and turn function OFF at the process menu.

❍ % Span

To convert a selected measurand display from a numerical value to a percentage of full scale reading, enable **SPAN** from the process menu and press F1 (SETTINGS) to provide access to the span definition parameters. Two span definitions are required, ***Zero*** and ***Full Scale***.

To leave span at current setting, press **EXIT**.

To define zero and full scale settings, proceed as follows.



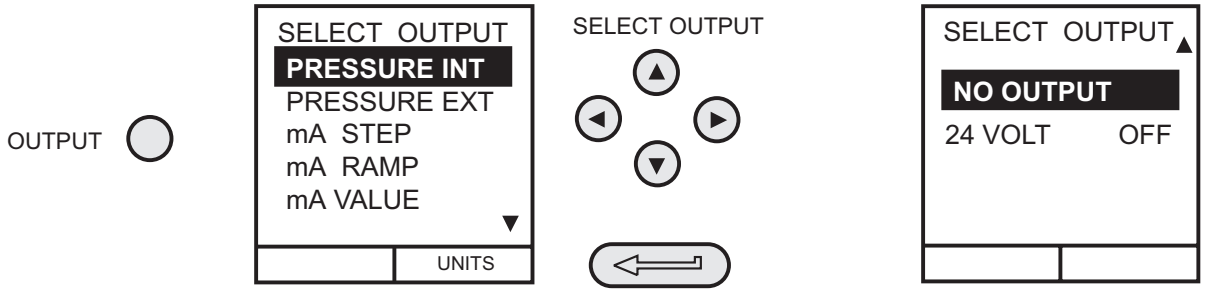
To cancel **% SPAN**, press **INPUT** and turn function OFF at the process menu.

Advanced Task

Select Output

To select an output channel for display, select **ADVANCED** mode from the Task menu and proceed as follows. If a channel has a range of units available, a **UNITS** soft box (actioned by the F2 function key), will be also be written to the display.

The following procedure shows the method of output channel selection. Note that there are two pages of options. The second page can be obtained directly from the first by pressing the **RIGHT** cursor key.



Note:

Left/right arrow keys function as page up/down keys.

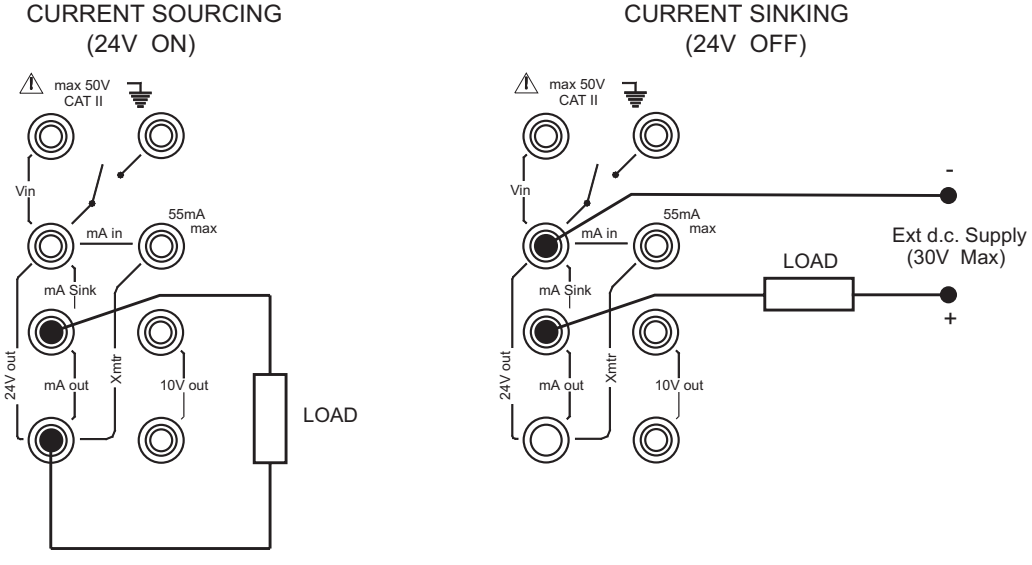
To change the output units (*Pressure* channels only), select the channel with the cursor keys and press F2 before pressing **ENTER**.

Electrical Outputs (Loop Power)

For all the electrical outputs, the output loop can be powered either by the instrument's internal 24V supply (Sourcing) or alternatively, from an external supply (current sinking).

To conserve battery power, the 24V internal supply should be switched off (even when not being used to power an external loop).

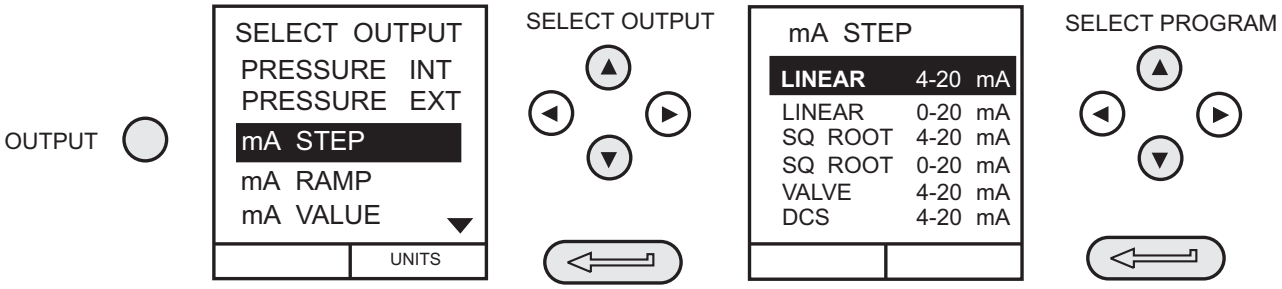
External connections to the front panel of the instrument are shown below for both sourcing and sinking applications (e.g.),



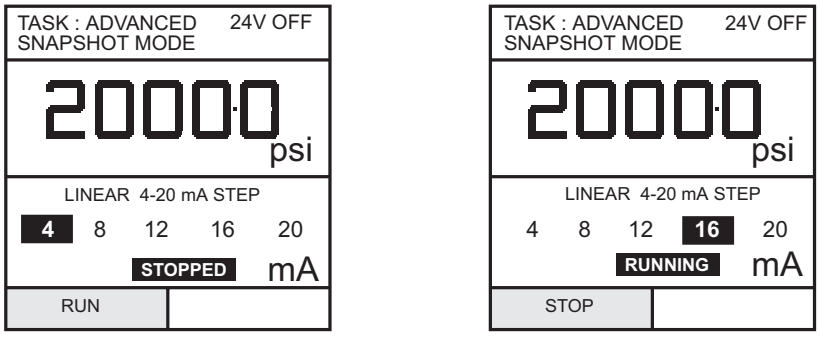
Advanced Task

mA Step

To select one of the electrical output programs, press the **OUTPUT** key and proceed as follows (e.g.),



On selection of (e.g.) Linear, the output display window changes to show the selected program of output currents (e.g.),



- To turn on the 24V supply for current sourcing applications, press the **OUTPUT** key, followed by the **Right** (➢)cursor key and select 24V. Use the **Right** (➢) cursor key again, followed by ENTER to switch on the 24V supply. For current sinking applications, connect an external supply as shown on Page 3-23 and leave the 24V internal supply switched **OFF**.

  Note:
  To conserve battery power, keep the 24V supply switched off when not in use (even if the output is unloaded).

- Press ***RUN*** (F1) to run program. A flashing status display ***CHECK LOOP*** indicates a fault in the external loop i.e. supply fault or open circuit.

  Note: *The dwell time at each step is approximately 10 seconds.*

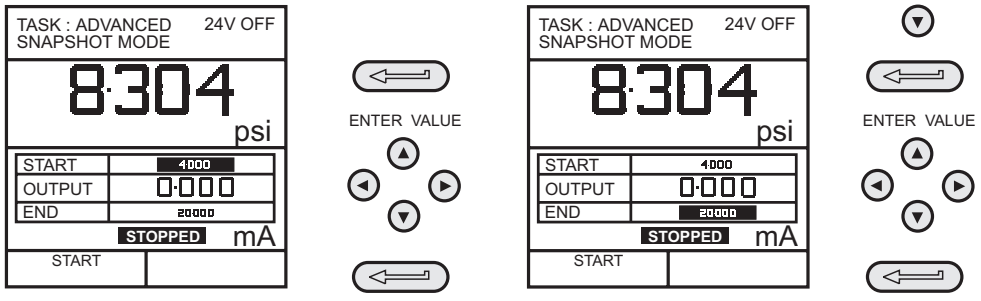
- Press ***STOP*** (F1) when running to stop at any point. Press ***RUN*** (F1) to resume.

Advanced Task

mA Ramp

Press the **OUTPUT** key and select **mA Ramp** in a similar manner to that shown above.

- Define ramp required by entering ***START*** and ***END*** current values as shown below (e.g.),

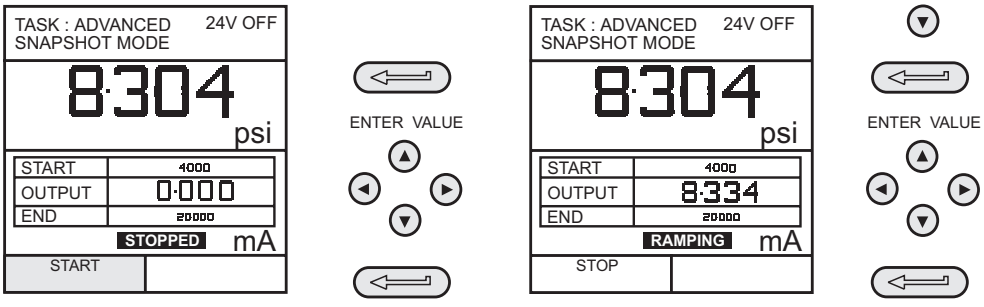


- To turn on the 24V supply for current sourcing applications, press the **OUTPUT** key, followed by the **Right** (➢)cursor key and select 24VOLT. Use the **Right** (➢) cursor key again, followed by ENTER to switch on the 24V supply. For current sinking applications, connect an external supply as shown on Page 3-23 and leave the 24V internal supply switched **OFF**.

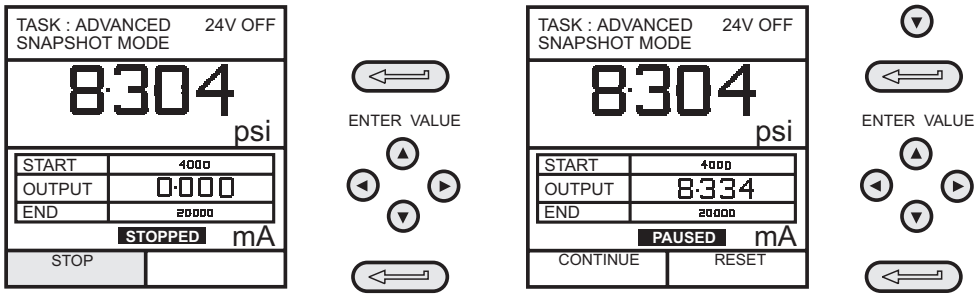
- Press ***START*** (F1) to run the program. A status display ***CHECK LOOP*** indicates a fault in the external loop i.e. supply fault or open circuit.

Note:

The ramp cycle (min to max or max to min), is approximately 60 seconds.



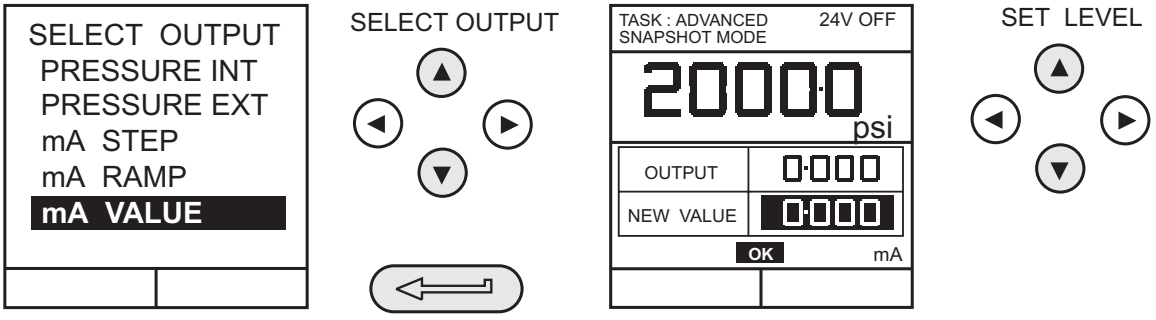
- Press ***STOP*** (F1) when running to stop at any point. Press ***CONTINUE*** (F1) to resume from point of pause or ***RESET*** (F2) to return to start point.



Advanced Task

mA Value

Press the **OUTPUT** key and select **mA Value** from the Output menu. The procedure is shown below (e.g.),



- To turn on the 24V supply for current sourcing applications, press the **OUTPUT** key, followed by the **Right** (➢)cursor key and select 24V. Use the **Right** (➢) cursor key again, followed by ENTER to switch on the 24V supply. For current sinking applications, connect an external supply as shown on Page 3-23 and leave the 24V internal supply switched **OFF**.

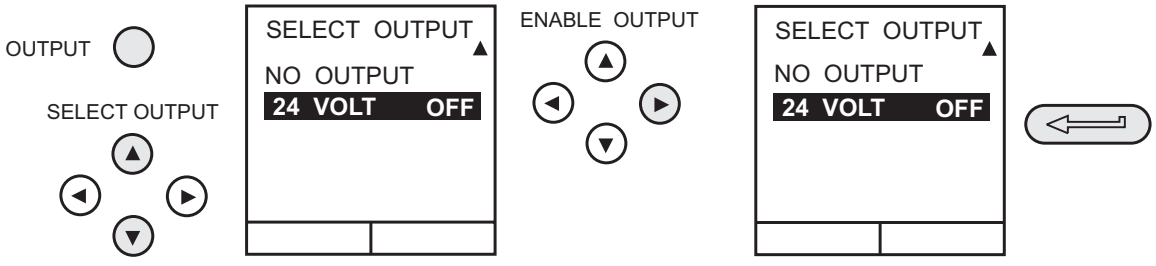
- Use **Up (⮝)** and **Down (⮟)** cursor keys to adjust output current level. Whilst the loop is made, a status display indicates **OK.** A status display ***CHECK LOOP*** indicates a fault in the external loop i.e. supply fault or open circuit.

24 Volt

Press the **OUTPUT** key and select **24 VOLT** from the Output menu. The procedure is shown below (e.g.),

Note:

The 24V selection is located on the second page of output functions.



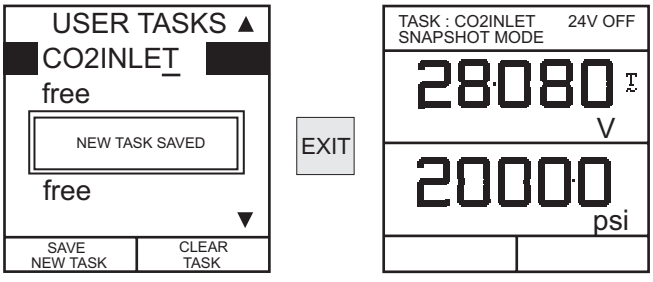
Note:
To conserve battery power, keep the 24V supply switched off when not in use (even if the output is unloaded).

Advanced Task

Define New Task

To define a new task, proceed as follows.

- Select **ADVANCED** from **TASKS** menu.
- Using the **INPUT** key, select the required measurand as the input display and set up any process functions required.
- Using the **OUTPUT** key, select the required measurand as the output display.
- Press **TASK** and select ***free***. Enter new task name as follows.



On completion of this procedure, the display reverts to newly set up task as shown.

Clear Task

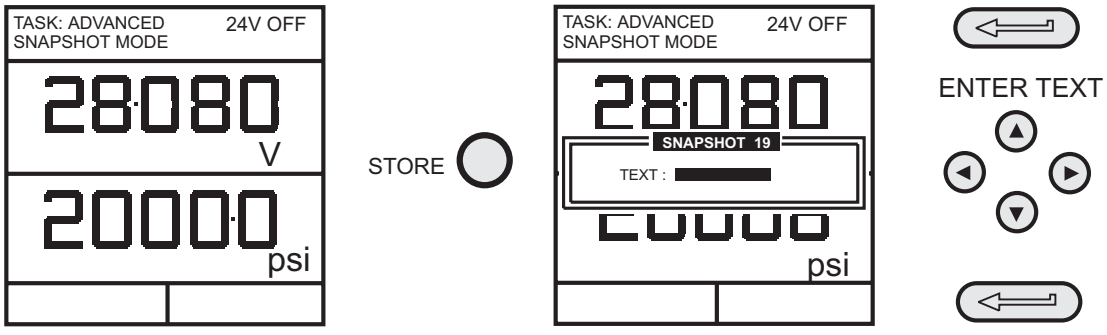
To clear a user defined task, select **TASK** and proceed as follows.

Memory Operations

Saving Display or Data Log

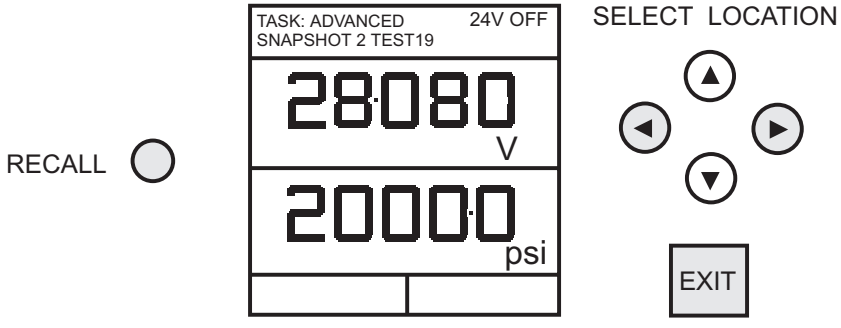
Memory operations depend upon how Store Mode has been set-up. Three options are available **None, Snapshot** and **Data Log.** Refer to **SETUP** for details.

Store Operations (Screen Snapshots)
To store any display (menu displays excepted), press the **STORE** key. This saves the current display to the next available location. Supporting text (10 characters) may be appended. Twenty memory locations are available on a cyclic buffer. When all 20 store locations have been used, store operations overwrite existing locations, starting at *Location 1.*



Recalling Stored Data (Screen Snapshots)

To recall a previously stored display, press the **RECALL** key. This recalls the last display saved. Press the **Left** (⋖) or **Right** (⋗) cursor keys to recall the previous or next locations respectively. To exit **RECALL**, press the **EXIT** key



Memory Operations

Data Log Operations

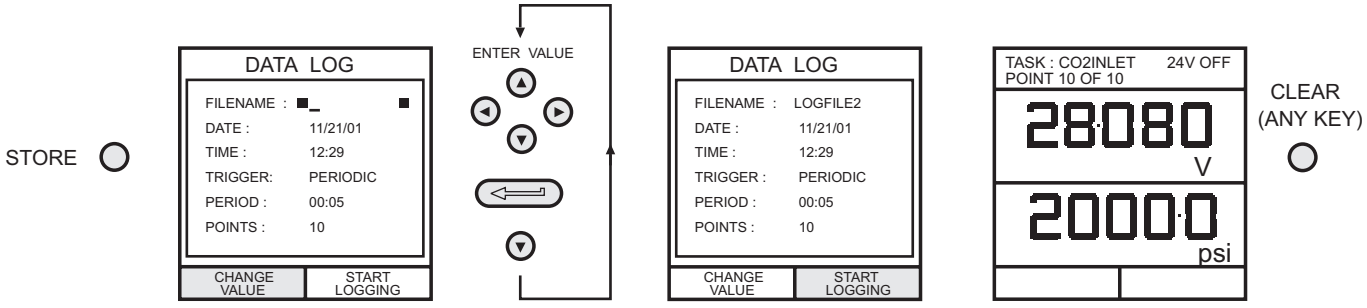
Data Log is a special application of store mode which enables the calibrator to either automatically log displays at preset time intervals or to manually log a display on operation of the **STORE** key. Logged data is written to a user specified file.

To set up a Data Log file, proceed as follows.

- ❍ Select a task, other than **BASIC**. If using **ADVANCED**, set up required Source and Output parameters.
- ❍ Use **SETUP** to select ***Data Log*** from the Store Mode Menu (See Page 3-36).

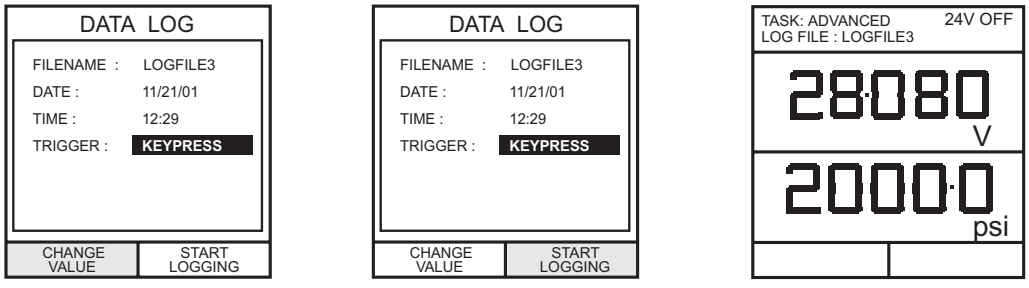
Auto Log (Timer)

Press **STORE** and set up the Data Log file parameters as shown below. Use ***CHANGE VALUE*** (F1) followed by cursor keys to set field values. For Auto Log, set ***TRIGGER*** field to ***PERIODIC***.

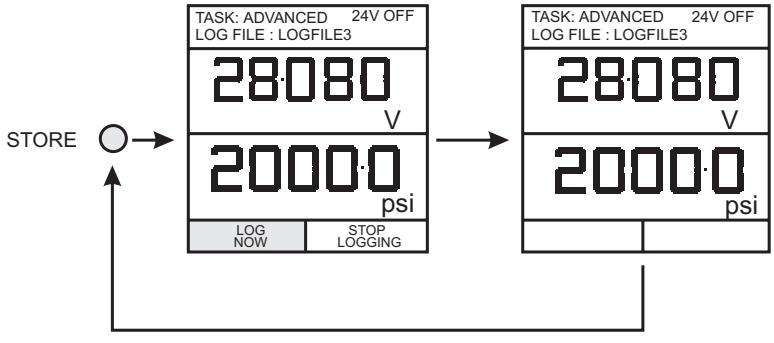


Manual Logging

Enter the file details as shown above and select ***KEYPRESS*** for ***TRIGGER*** field. Screen reverts to displayed parameters showing setup file as shown below (e.g.),



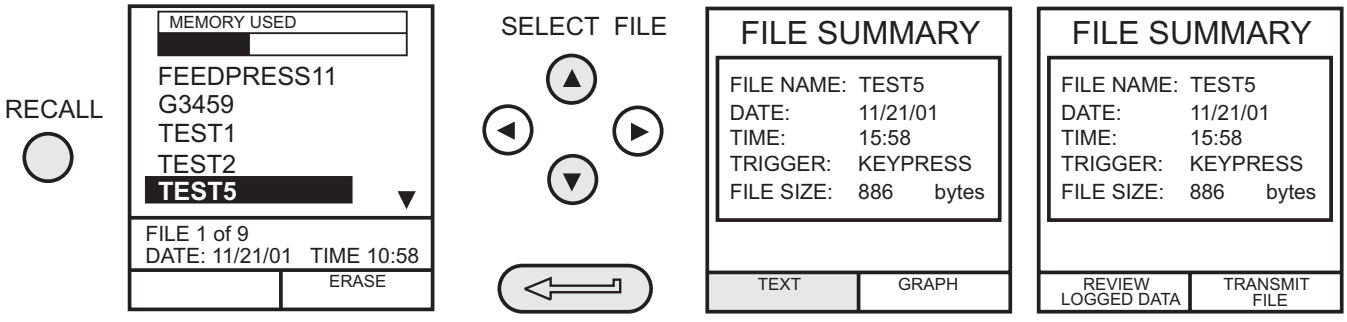
- ❍ Use a combination of **STORE** and ***LOG NOW*** (F1) to log events as follows.



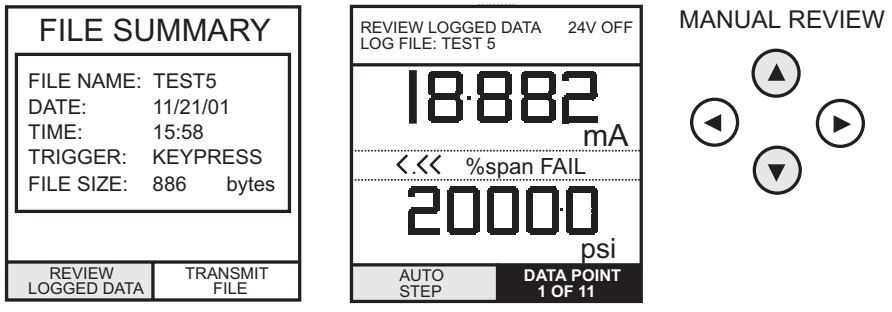
Memory Operations

Recall Data Log Files

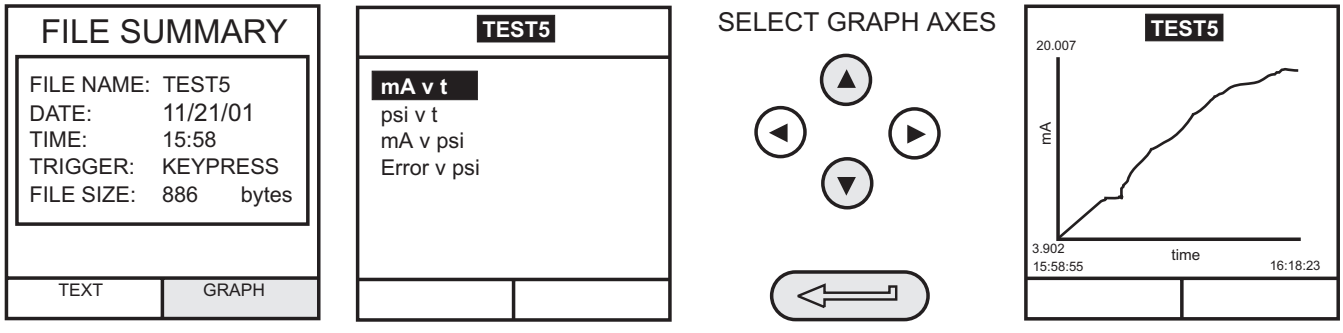
To recall a datalog file to the display, ensure that **DATALOG** is selected from the SETUP menu and proceed as follows (e.g.),



Data Log files can be displayed either as text (stored screens) or in graphical form. To display as text, proceed as follows from the File Summary menu. Select Auto Step to automatically review each screen at 1 second intervals or use the left and right cursor keys to manually review.



To display logged data in graphical form, on screen, proceed as follows from the File Summary menu (e.g),

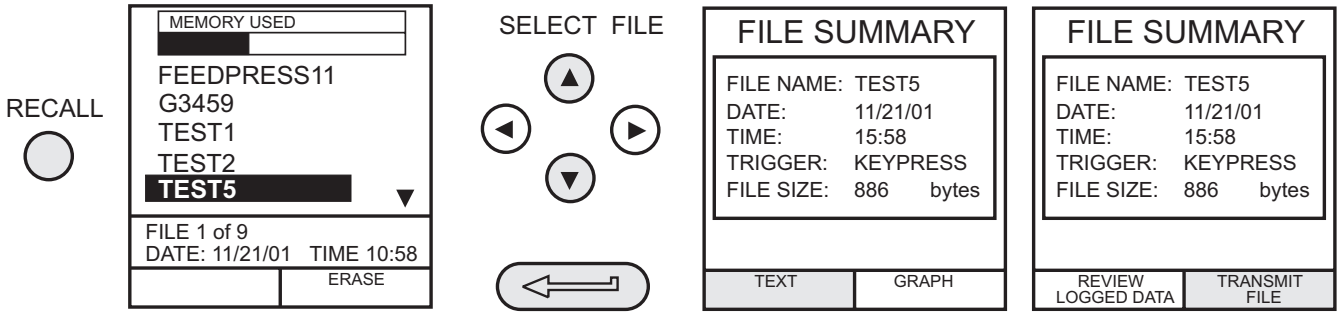


Memory Operations

Uploading Data Log Files

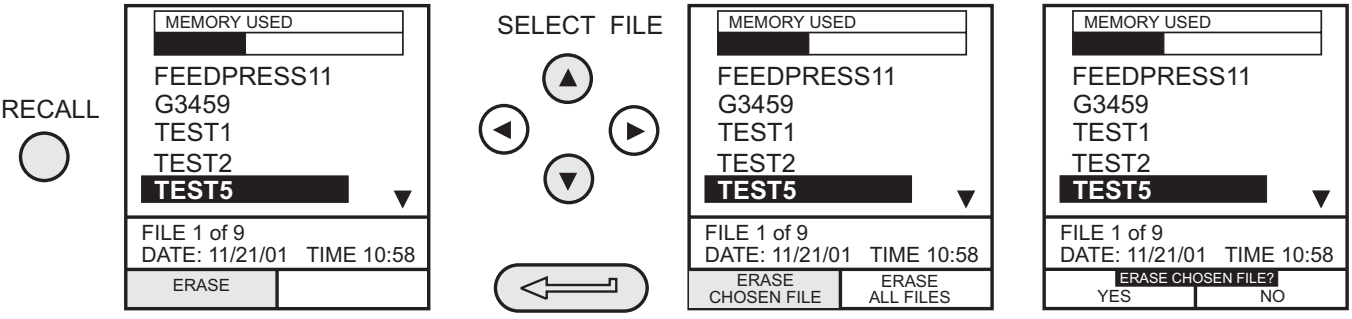
Connect the RS232 socket of the instrument into either the COM1 or COM2 port of the PC. Ensure that the RS232 parameters at the PC end match those of the instrument. The RS232 parameters of the instrument can be checked as detailed on page 3-38. Set up a file on the PC to receive the data, (e.g.) in the *Windows Terminal* program.

To upload a file, proceed as follows. Example 1, page 3-40, gives details of a typical uploaded Data Log file.



Delete Data Log and Procedure Files

To delete a Data Log file, or a procedure file, proceed as follows. Alternatively, to delete all logged files simultaneously, select ***ERASE ALL FILES*** (F2) at the erase screen.



Memory Operations

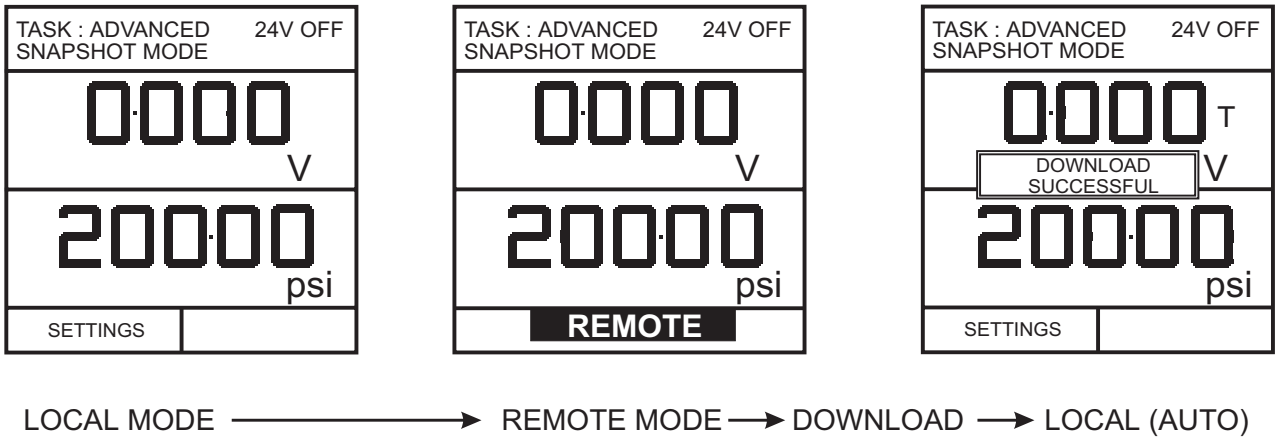
Downloading Procedure Files (DPI 325 Calibrators Only)

Complete test procedures may be downloaded from a PC to DPI 325 instrument types via the RS 232 port. A procedure consists of a number of Druck Universal Command Interface (DUCI) commands which are usually assembled by a linking management software application (e.g.) **Druck Intecal_W**.

Before downloading a procedure, the DPI 325 must be in the REMOTE mode. To place the instrument into REMOTE mode, proceed as follows.

- Connect the instrument's RS232 port to a free COM port on a PC.
- Ensure that the COMMS parameters of the PC match those of the instrument (refer to page 3-38).
- Ensure that the instrument is not already running a procedure. If it is, quit the procedure.
- Download the procedure. Procedures are stored in the Data Log directory.

The following sequence shows a typical download sequence which commences with the instrument in LOCAL mode.

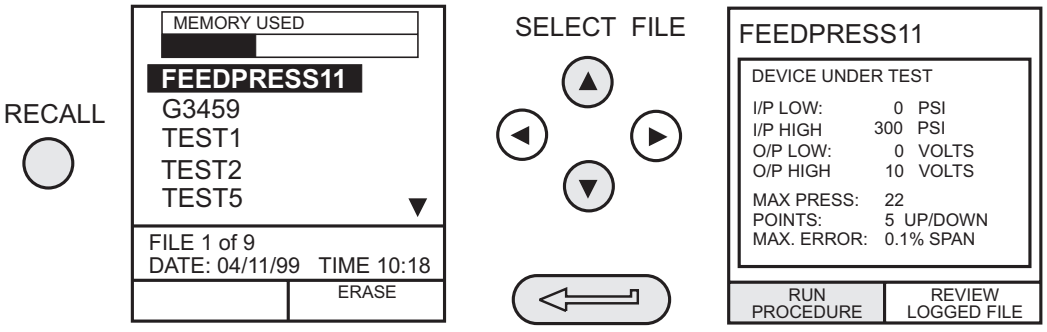


After the procedure file has been downloaded, the instrument is usually returned to the LOCAL mode by the last command in the procedure file. If the instrument remains in REMOTE mode, switch it OFF and back ON to reset it.

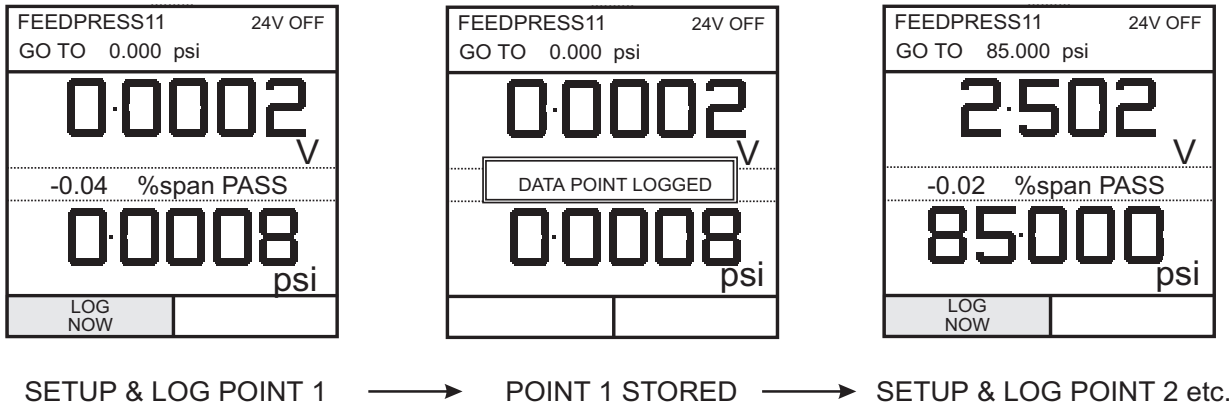
Memory Operations

Running Procedure Files (DPI 325 Calibrators Only)

To run a procedure, ensure that the DPI 325 is set to the Data Log mode (see page 3-36), and proceed as follows.



After selecting F1, proceed by entering the User ID and Serial Number and then select F1 (Continue) and follow the on-screen procedural instructions (e.g.),



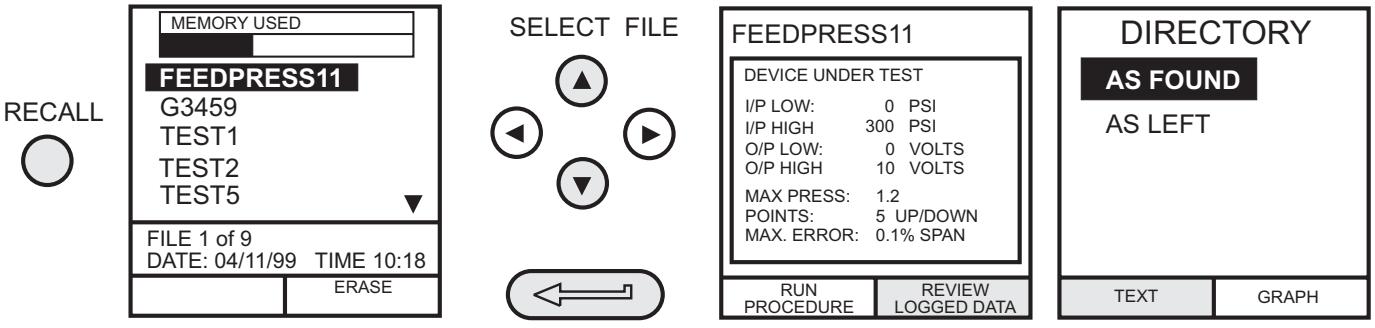
When the test procedure for a given DUT has been completed, the result of running the first test is stored as an AS FOUND file. This file cannot be overwritten. Any subsequent tests on the device are stored as an AS LEFT file which is overwritten each time the procedure on this device is run.

When recalling the results of a procedure, the choice of AS FOUND or AS LEFT is provided (refer to page 3-34).

Memory Operations

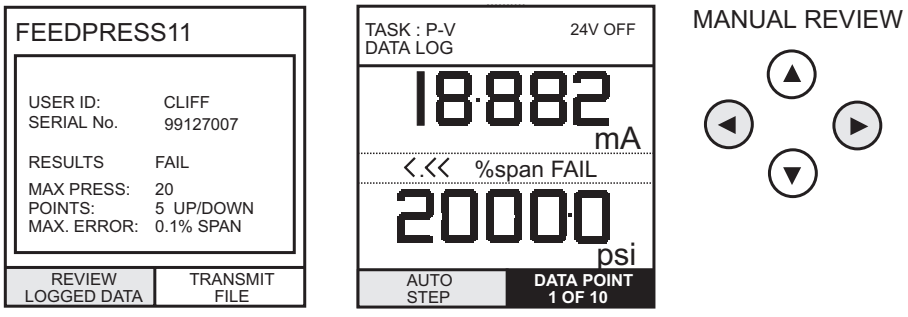
Recalling Data Files (DPI 325 Calibrators Only)

Data or results files generated by running procedures are stored in the instrument's Data Log directory. To recall a data file to the display, ensure that **DATA LOG** is selected from the SETUP menu and proceed as follows (e.g.),



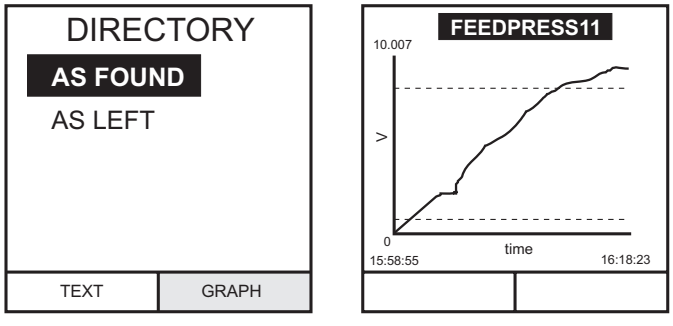
Use the cursor keys to select either the AS FOUND option or the AS LEFT option for display. AS FOUND is the result of the first run of a procedure and AS LEFT is the result of the last time the procedure was run.

Procedure data files can be displayed either as text (stored screens) or in graphical form. To display as text, select the **TEXT** option (F1) from the directory and proceed as follows from the File Summary menu. Select ***AUTO STEP*** (F1) to automatically review each screen at 1 second intervals or use the left and right cursor keys to manually review.



To transmit the selected logged data via the RS 232 interface, connect the instrument to a free port on an external PC, ensure that the instrument's RS 232 parameters match those of the PC. Example 2, page 3-40, shows a typical uploaded Procedure results file.

To display logged data in graphical form, on screen, select ***GRAPH*** (F2) from the directory and proceed as follows (e.g),



Using Setup

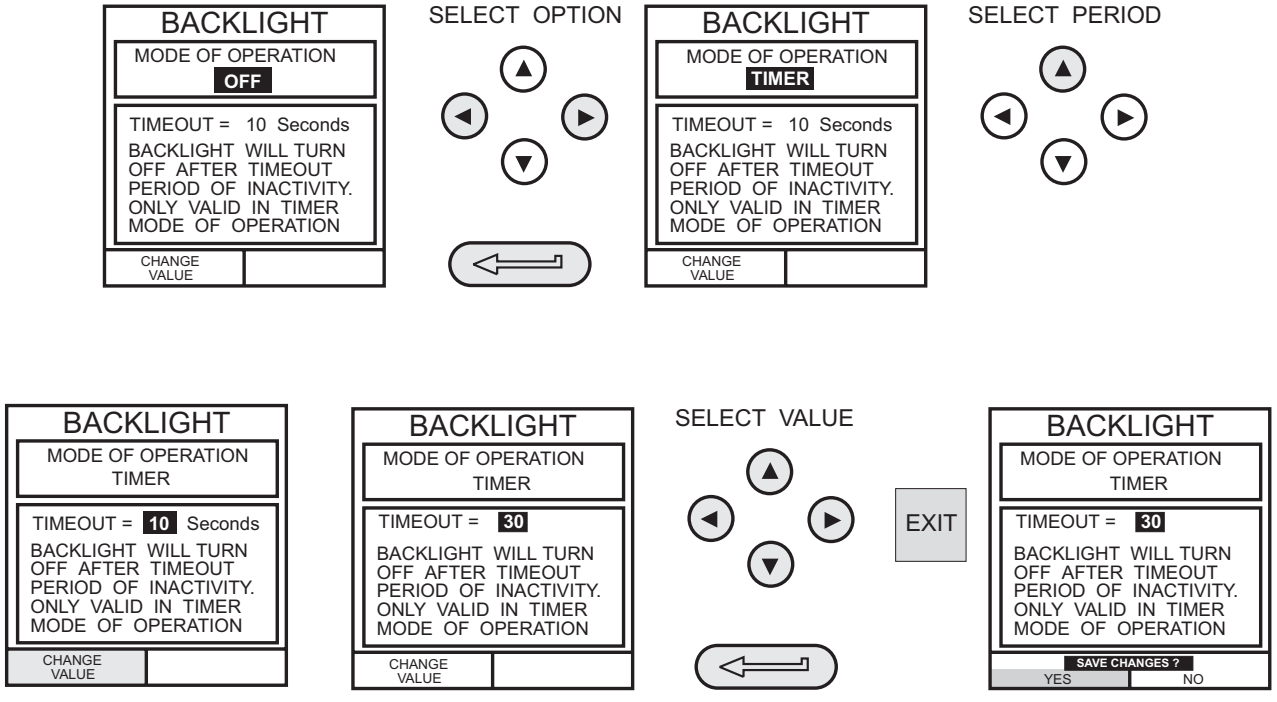
General

SETUP mode is available in all modes except **BASIC.** It permits the setup of the following instrument parameters.

- Backlight Management - On, Off and Timed.
- Store Mode - None, Snapshot, Data Log.
- Contrast.
- Date and Time (Real Time Clock).
- Instrument Settings - Units, Language, RS232 parameters, Powerdown, and Calibration Routines *(Refer to Section 5 for Calibration details)*.

Backlight

Select Backlight from the Setup menu and proceed as follows.


BACKLIGHT
MODE OF OPERATION
OFF
TIMEOUT = 10 Seconds
BACKLIGHT WILL TURN OFF AFTER TIMEOUT PERIOD OF INACTIVITY. ONLY VALID IN TIMER MODE OF OPERATION
CHANGE VALUE
SELECT OPTION
BACKLIGHT
MODE OF OPERATION
TIMER
TIMEOUT = 10 Seconds
BACKLIGHT WILL TURN OFF AFTER TIMEOUT PERIOD OF INACTIVITY. ONLY VALID IN TIMER MODE OF OPERATION
CHANGE VALUE
SELECT PERIOD
BACKLIGHT
MODE OF OPERATION
TIMER
TIMEOUT = 10 Seconds
BACKLIGHT WILL TURN OFF AFTER TIMEOUT PERIOD OF INACTIVITY. ONLY VALID IN TIMER MODE OF OPERATION
CHANGE VALUE
BACKLIGHT
MODE OF OPERATION
TIMER
TIMEOUT = 30
BACKLIGHT WILL TURN OFF AFTER TIMEOUT PERIOD OF INACTIVITY. ONLY VALID IN TIMER MODE OF OPERATION
CHANGE VALUE
SELECT VALUE
EXIT
BACKLIGHT
MODE OF OPERATION
TIMER
TIMEOUT = 30
BACKLIGHT WILL TURN OFF AFTER TIMEOUT PERIOD OF INACTIVITY. ONLY VALID IN TIMER MODE OF OPERATION
SAVE CHANGES ?
YES
NO

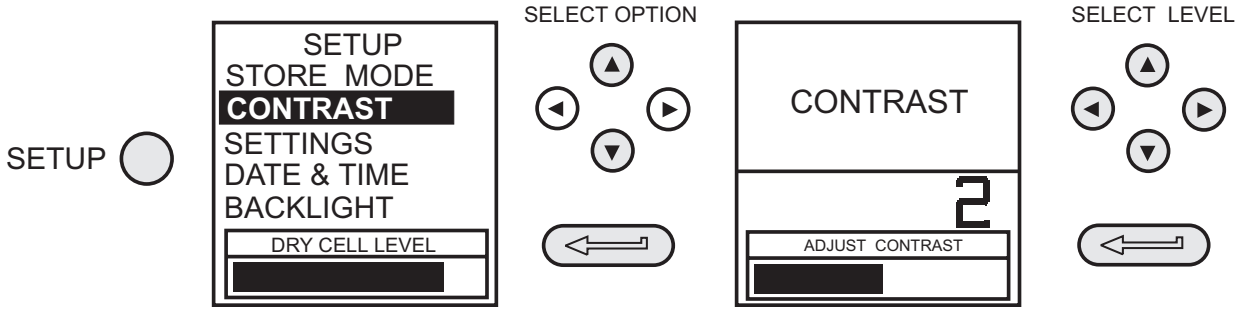
If **TIMER** mode is selected, any key press brings on the backlight for the **TIMER** period.

If **ON** is selected, the backlight remains on permanently and if **OFF** is selected, the backlight remains permanently off.

Using Setup

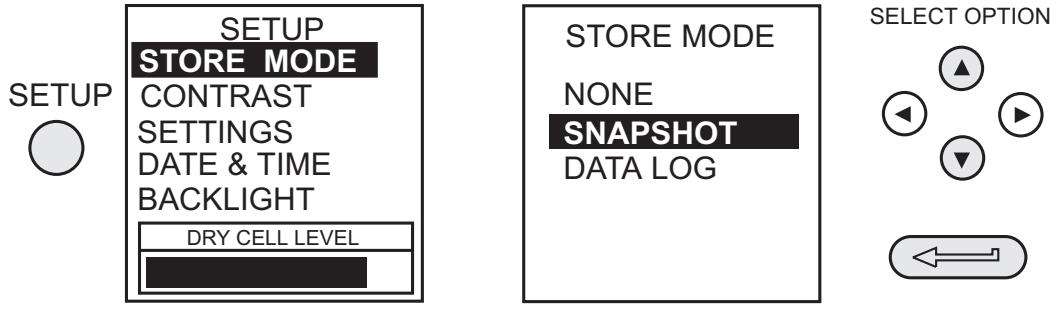
Contrast

Select ***CONTRAST*** from the Setup Menu and proceed as follows.



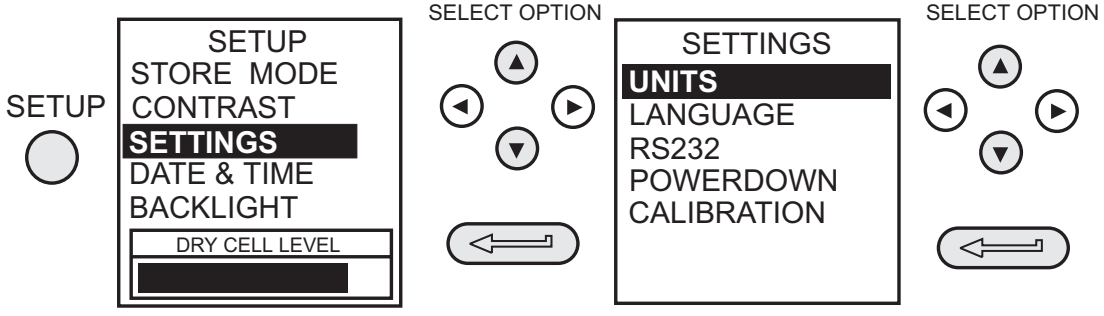
Store Mode

Select ***STORE MODE*** from the Setup menu and select required mode as follows.



Settings - Select Setup Option

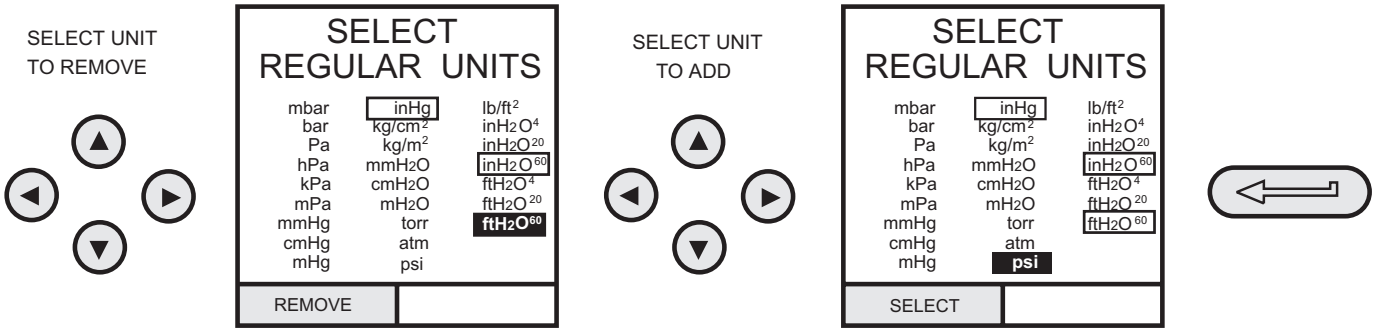
To select one of the Settings options from the Setup menu, proceed as follows.



Using Setup

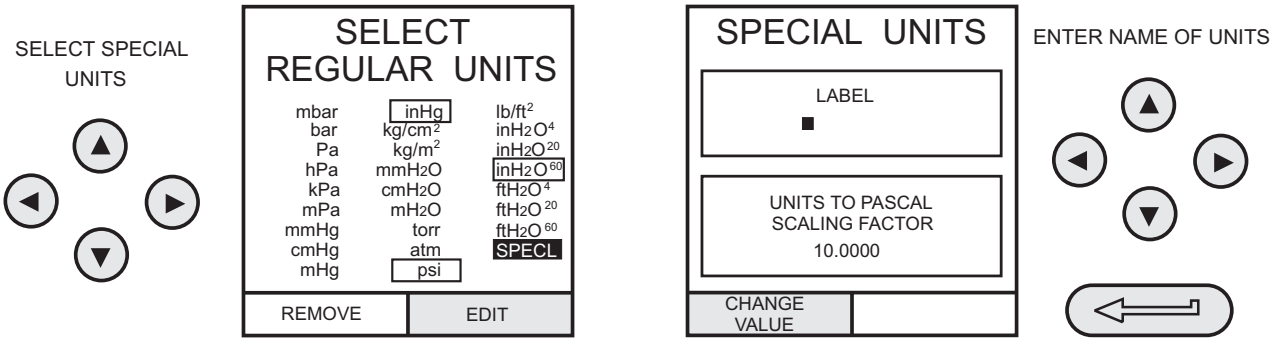
Units

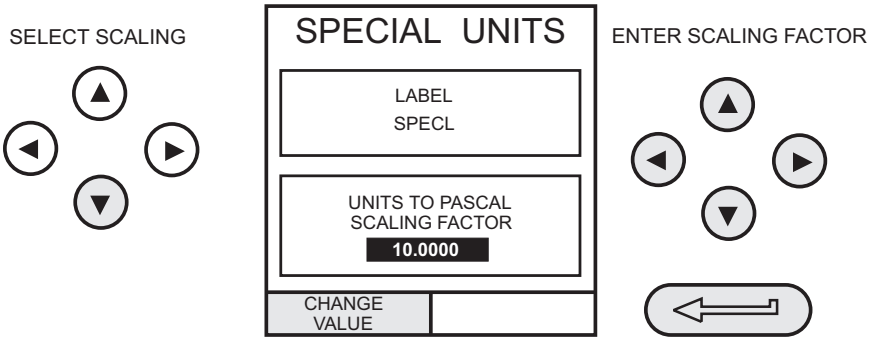
Select (pressure) Units from the Settings menu and proceed as follows.


SELECT UNIT TO REMOVE
SELECT REGULAR UNITS
mbar bar Pa hPa kPa mPa mmHg cmHg mHg
inHg kg/cm² kg/m² mmH2O cmH2O mH2O torr atm psi
lb/ft² inH2O4 inH2O20 inH2O60 ftH2O4 ftH2O20 ftH2O60
REMOVE
SELECT UNIT TO ADD
SELECT REGULAR UNITS
psi
SELECT

Define Special Units

Select (pressure) Units from the Settings menu, and select Special Units and proceed as follows.





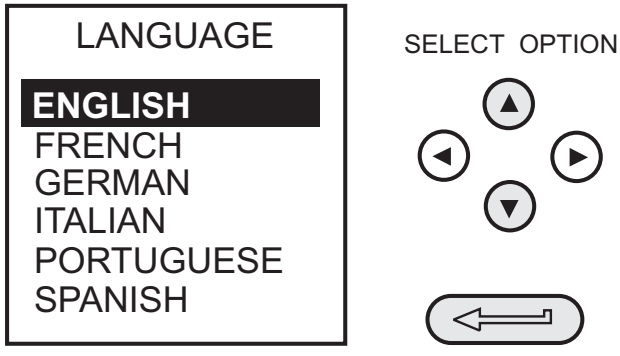
EXAMPLE
feet of sea water

ftH.O sea
specific gravity 1.0281 at 0°C/32°F
with salinity of 3.5%:
conversion factor 3073.062

see the preliminary pages of the manual for a table of conversion factors.

Language

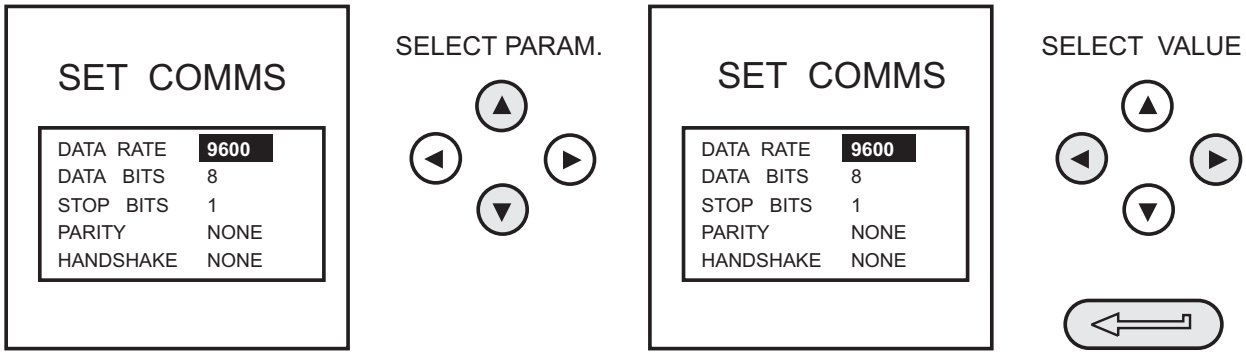
Select the ***LANGUAGE*** version required from the Settings menu and proceed as follows.



Using Setup

RS232

Select ***RS232*** from the Settings Menu and proceed as follows.



Note:

Communications default settings are shown above.

Powerdown

Select ***POWERDOWN*** from the Settings menu. The method of setting up the **Powerdown** (Auto Power Off) function is similar to that detailed for the Backlight (page 3-35).

If **TIMER** mode is selected, following a period of inactivity, the instrument will automatically power off after the preset **TIMER** period.

If **OFF** is selected, auto power off is inhibited and once switched on, the instrument will remain **ON** until it is manually switched **OFF**.

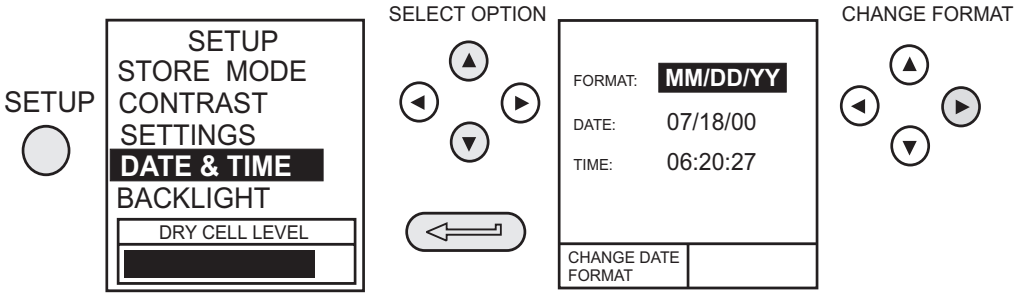
Calibration

Calibration routines are described in Section 5.

Date and Time (Real Time clock)

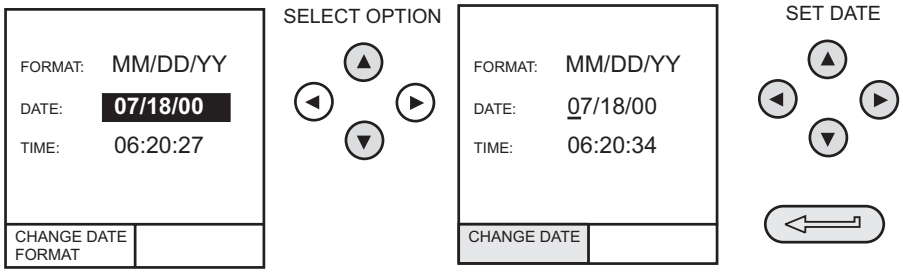
Date Format

To set up the real time clock, select ***DATE & TIME*** from the set up menu and, using the right arrow key, set up the required date format as shown below (e.g.),



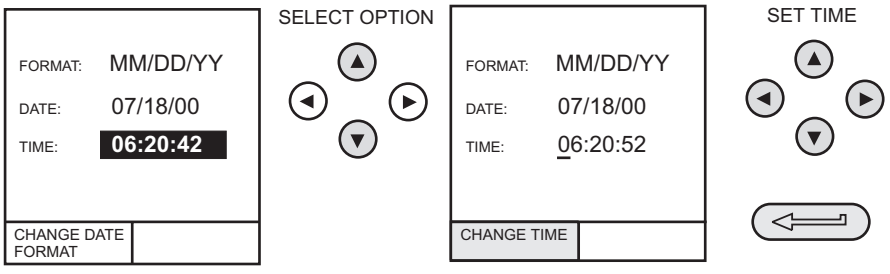
Set Date

Select ***DATE*** from the **DATE & TIME** menu and change the date by means of the cursor keys as shown below. The up/down keys change the numerical value of the selected digit (indicated by the underline cursor) and the left/right keys select the required digit position.



Set Time

Select ***TIME*** from the **DATE & TIME** menu and change the time by means of the cursor keys as shown below. The up/down keys change the numerical value of the selected digit (indicated by the underline cursor), and the left/right keys select the required digit position.



Example 1 - Uploaded Datalog File

The following gives details of a typical data file upload.

FILENAME: TEST 5
DATE: 05/11/1999
TIME: 15:58
TRIGGER: KEYPRESS
AMBIENT TEMP : 24.1 C

NO. OF POINTS 11
RECORD TYPE 2048

CURRENT PRESSURE mA INT psi

3.902	1.16	-0.65	05/11/1999	15:58:55
6.076	335.18	1.42	05/11/1999	16:00:03
7.598	638.75	0.47	05/11/1999	16:00:57
8.085	728.52	0.41	05/11/1999	16:01:45
9.949	1081.37	0.94	05/11/1999	16:02:42
13.002	1638.90	-0.23	05/11/1999	16:03:30
17.005	2335.40	0.77	05/11/1999	16:05:00
17.766	2481.01	0.51	05/11/1999	16:06:07
17.812	2481.02	0.80	05/11/1999	16:07:49
18.532	2605.60	1.00	05/11/1999	16:16:35
20.007	2931.50	-1.02	05/11/1999	16:18:23

The **Record Type** number contained in the header is a 16 bit field, with the individual bits representing result formats as detailed below.

Record Type 1	P-Display
Record Type 2	Switch Test
Record Type 4	Leak Test
Record Type 8	Input channel: Min/Max ON
Record Type 120	Combination of all input process functions
Record Type 896	Combination of all output process functions
Record Type 1024	mA step mode
Record Type 2048	mA value mode
Record Type 4096	mA ramp mode
Record Type 8192	no input selected
Record Type 16384	no output selected

Example 2 - Uploaded Procedure Data File (DPI 325 Calibrators only)

The following gives details of a typical data file upload.

FILENAME: TEST 5
DATE: 05/11/1999
TIME: 15:58
TRIGGER: KEYPRESS
AMBIENT TEMP : 24.1 C

NO. OF POINTS 11
RECORD TYPE 0
CURRENT mA PRESSURE INT psi

3.902	1.16	-0.65% span PASS	05/11/1999	15:58:55
6.076	335.18	1.42% span FAIL	05/11/1999	16:00:03
7.598	638.75	0.47% span PASS	05/11/1999	16:00:57
8.085	728.52	0.41% span PASS	05/11/1999	16:01:45
9.949	1081.37	0.94% span PASS	05/11/1999	16:02:42
13.002	1638.90	-0.23% span PASS	05/11/1999	16:03:30
17.005	2335.40	0.77% span PASS	05/11/1999	16:05:00
17.766	2481.01	0.51% span PASS	05/11/1999	16:06:07
17.812	2481.02	0.80% span PASS	05/11/1999	16:07:49
18.532	2605.60	1.00% span PASS	05/11/1999	16:16:35
20.007	2931.50	-1.02% span FAIL	05/11/1999	16:18:23

The **Record Type** number contained in the header is a 16 bit field, with the individual bits representing result formats as detailed below.

Record Type 1	P-Display
Record Type 2	Switch Test
Record Type 4	Leak Test
Record Type 8	Input channel: Min/Max ON
Record Type 120	Combination of all input process functions
Record Type 896	Combination of all output process functions
Record Type 1024	mA step mode
Record Type 2048	mA value mode
Record Type 4096	mA ramp mode
Record Type 8192	no input selected
Record Type 16384	no output selected

CONTENTS

Section 4 - Routine Maintenance

Cleaning 4-1
Fault Finding 4-1

Maintenance

Cleaning

Clean the external surfaces of the calibrator with a damp cloth and mild detergent.

Fault Finding

Pressure Faults

If the required calibrator pressure cannot be reached, check the following:

1. Check that sufficient charge is available in the gas cylinder.

2. Allow sufficient time after pressure generation for the temperature to stabilize.

3. Check that the plug in the second test port is fully tightened and is sealing correctly.

3. Check the adaptors, flexible pipe and connections between the calibrator and the equipment under test for leaks. Tighten any loose joints and replace any seals that are worn or damaged.

4. Carry out a leak test with the system under test connected (see page 3-15).
   Note: *allow a sufficiently long wait period for pressure variations due to temperature effects to stabilise.*

5. If a leak is detected, to determine that the leak is in the external system, make sure that the ball valve is set to **Fine** and open the purge valve. Disconnect the external system and refit the sealing plug to the test port. Close the purge valve and pressurise the calibrator's output manifold. Carry out a leak test with no external system connected (see page 3-14).
   Note: *allow a sufficiently long wait period for pressure variations due to temperature effects to stabilise.*

Electrical faults

1. If the instrument will not switch on, this indicates that the battery is discharged. Plug in the power adapter/charger unit and allow the battery to charge. The instrument should run as soon as the power adaptor is connected.

2. If the low battery warning is displayed, approximately one minute of operating time is left before the instrument turns off. Plug in the power adapter/charger unit (see page 3-3).

3. If the instrument keeps switching off check that the timing on the Auto Power Off facility is not set to too short a period. Alternatively, switch the Auto Power Off feature to OFF (see page 3-38). Check also the charge state of the battery

Gas Cylinder Certification

The label on the front of the calibrator indicates the date that the gas cylinder was last certified. It is recommended that the gas cylinder be re-certified at intervals of **5 years.**

Check label to see if re-certification is due.

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Calibration

Introduction

The instrument is supplied by the manufacturer, complete with calibration certificate(s). The re-calibration interval will depend on the total measurement uncertainty which is acceptable for a particular application. A period of 12 months is recommended but this may be influenced by many factors including conditions of service.

The DPI 320 and DPI 325 calibrators are very precise measuring instruments and the test equipment and conditions of test must be suitable for the type of work. The use of a Class A compensated deadweight tester is essential. The tests should be carried out in a controlled environment by a competent, trained person.

If, when the accuracy of the instrument is checked, it is found to fall outside the specification, calibration adjustment can be undertaken to compensate errors.

The manufacturer offers a comprehensive and, if required, UKAS accredited calibration service.

General Procedures

The following general hints are provided as a guide to calibration procedures.

Do

Use high quality ***Repeatable and Linear*** pressure sources and allow adequate stabilization time before calibration (minimum 1 hour).

Carry out the calibration procedures in a temperature and, preferably, humidity controlled environment. Recommended temperature is **70°F, ±3.6°F (21°C, ±2°C)** .

Use deadweight testers carefully and away from drafts.

Calibration Protection

In order to protect against accidental loss, the calibration of this calibrator is protected by a PIN number. Initially, this PIN number is set to 4321. To prevent unauthorized access to the calibration routines, it is recommended that this PIN number should be changed at the earliest opportunity (refer to page 5-3).

Calibration Check

Compare the calibrator readings with a known standard. Any deviations between the calibrator and the standard should be noted, taking due account of the traceability (accuracy to a National Standard). If these deviations exceed the published tolerance, or any other suitable chosen performance standard, then a calibration adjustment can be carried out.

It is recommended that measurements be checked at 0, 20, 40, 60, 80 and 100% of full-scale in an ascending and descending order. Refer to Tables 5-1 to 5-4, pages 5-15 to 5-16, for details of test inputs and tolerances.

Calibration Adjustment

If the calibrator is operating correctly, only zero and full-scale calibration will vary. Any excessive non-linearity or temperature effects indicate a fault. In these circumstances, the calibrator should be returned to a qualified service agent (refer to preliminary pages).

Calibration Procedures

Test Equipment

The following laboratory standard test equipment will be required for the calibration procedures:-

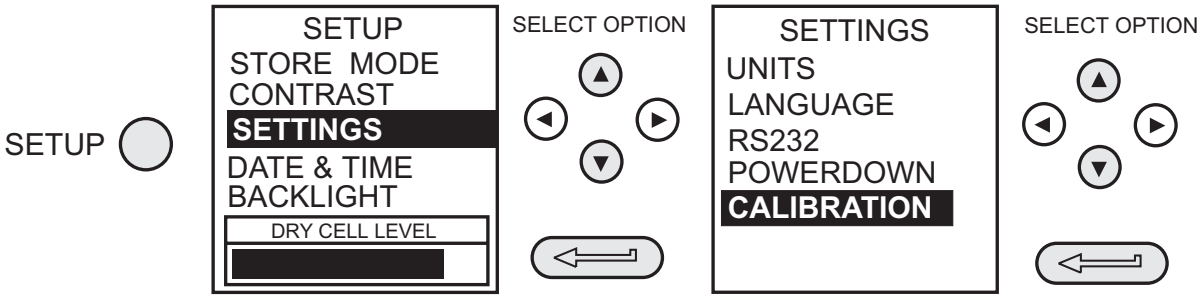
Instrument Range	Calibration Equipment Accuracy	Calibration Uncertainty
5V Input	± 30 ppm ± 1 digit	± 10 ppm ± 5 µV
50V Input	± 45 ppm ± 1 digit	± 11 ppm ± 110 µV
55 mA Input	± 150 ppm ± 4 digits	± 100 ppm ± 1 nA
24 mA Output	± 150 ppm ± 4 digits	± 160 ppm ± 1 nA
Ambient Temp	± 0.2 °C	± 1°C ± 1 digit
Pressure Int/Ext	Class A Deadweight	< 0.025%

Using the Calibration Menu

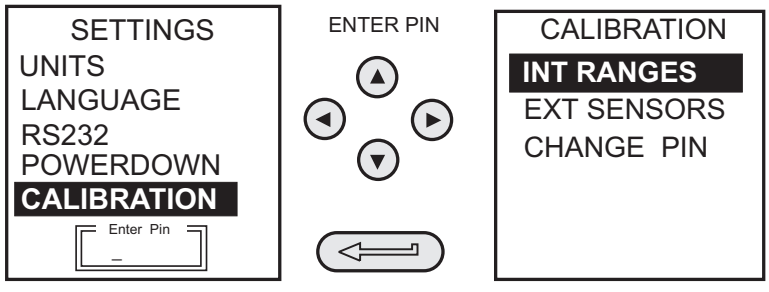
The calibration routines are selected from the Setup menu as detailed below. The calibration routines are not accessible while the calibrator is in BASIC mode. If necessary, use the TASK key to select another mode (e.g.) ADVANCED before attempting to access the CALIBRATION mode.

Review and become familiar with the whole calibration procedure before commencing the calibration process.

To enter the CALIBRATION mode, press SETUP and select CALIBRATION from the menu as shown below.

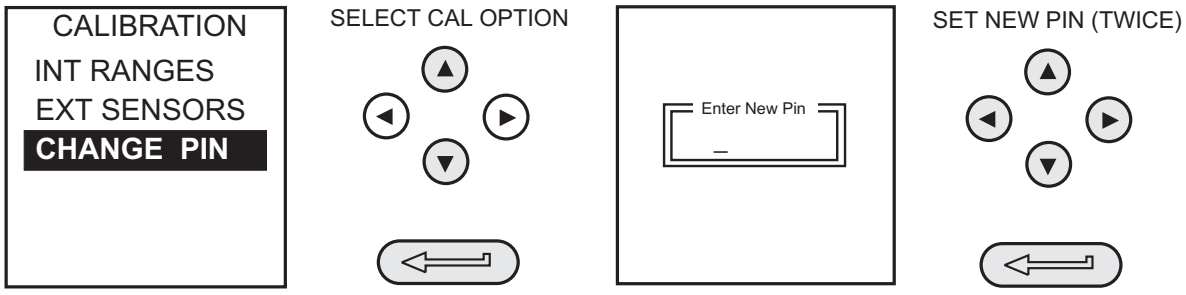


Use a combination of the cursor keys to enter the PIN number (initially set to 4321) as shown over page. The **Up** and **Down** keys enter numerals (0 to 9) or (9 to 0) respectively and the **right** and **left** keys shift number position. If the **Enter pin** prompt disappears before the first digit is entered, press ENTER to re-display. The internal ranges are selected for calibration as shown below.



Change Calibration PIN Number

The Calibration PIN number is changed from the Calibration Menu. Use the cursor keys to select CHANGE PIN and proceed as follows.



Note:

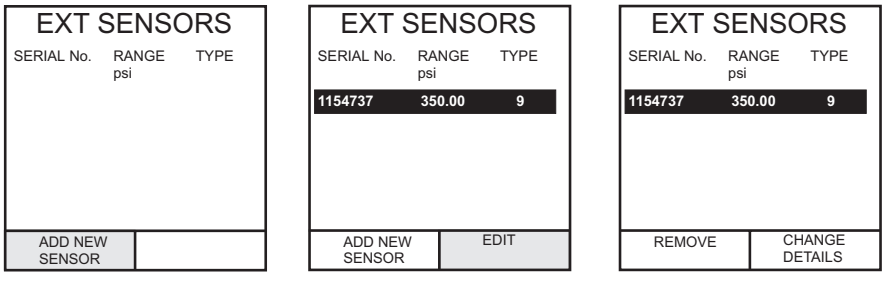
The new PIN number requires to be entered twice, the second entry being used to verify the change. If the second PIN number entry differs from the first, the PIN number is not changed and the following error message is displayed.

Add External Sensor

To add an external sensor to the directory of external sensors, proceed as follows.

- Press SETUP, select SETTINGS, followed by CAL:IBRATION and enter the calibration PIN number as shown on page 5-2. Select EXT SENSORS.

- Plug the external transducer into the connector located on top of the instrument and proceed as shown below.



Digitally characterised Druck transducers will be downloaded into the directory as soon as the F1 key is operated. Data for other types can be edited by selecting ***EDIT*** (F2). If the data cannot be edited a warning message (INVALID ACTION) is displayed.

Calibration Procedures
Calibrate Internal Ranges

Pressure

The following procedure should be adopted for calibrating the internal pressure range.

(1) Ensure that the gas bottle is fully charged. The charging procedure is described on page 3-2.

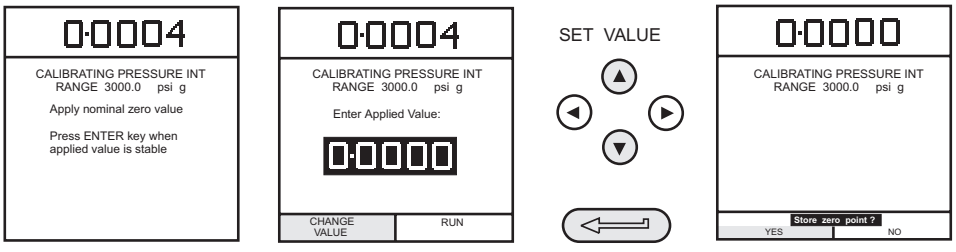
(2) Allow the calibrator's temperature to stabilize in the test environment for a minimum of 1 hour.

(3) Ensure that the **Coarse** pressure regulator is set to ZERO (fully counter clockwise), that the ball valve is set to **Coarse** and that the purge valve is OPEN.

(4) Connect the output port of the calibrator to a pressure standard (suitable deadweight tester) and CLOSE the purge valve.

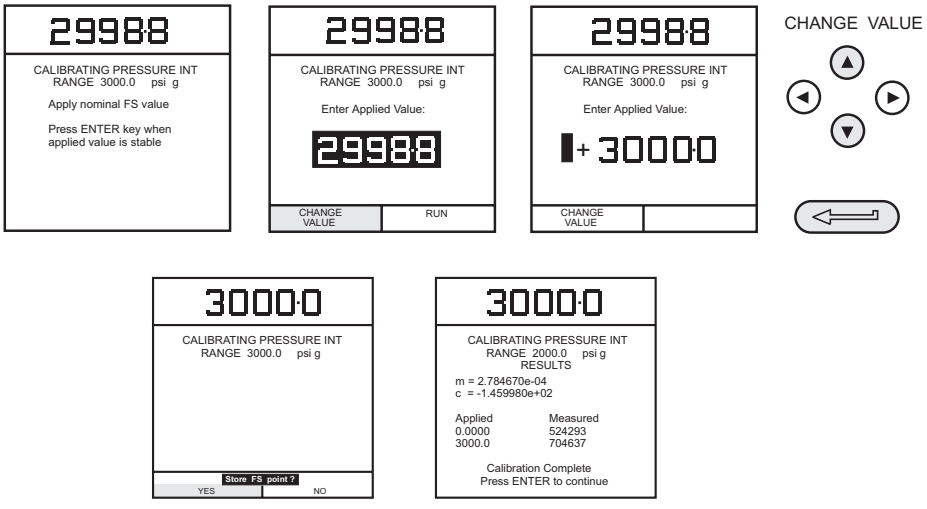
(5) Switch the calibrator on, enter CALIBRATION mode and select INT RANGES from the CALIBRATION menu as shown on page 5-2 and then PRESSURE INT.

(6) Apply zero pressure and store the zero point as shown below (e.g.),



(7) Slowly open the Coarse regulator and apply full scale pressure to the pressure reference.

(8) Set the ball valve to **Fine** and allow the output pressure to stabilise. Use the **Fine** volume adjuster to trim the output pressure to exactly 3000 psi (as indicated by the pressure reference). Store the full scale point as shown below (e.g.)



(9) Press the ENTER key to accept the calibration. Press the EXIT key four times to quit the CALIBRATION and SETUP modes.

(10) Check calibration by applying test pressures detailed in Table 1, Page 5-15.

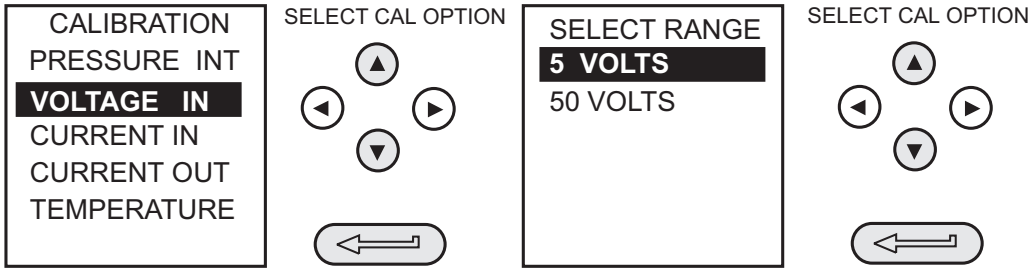
Voltage Input Range (5 Volts)

The following procedure should be adopted for calibrating the internal 5 Volt range.

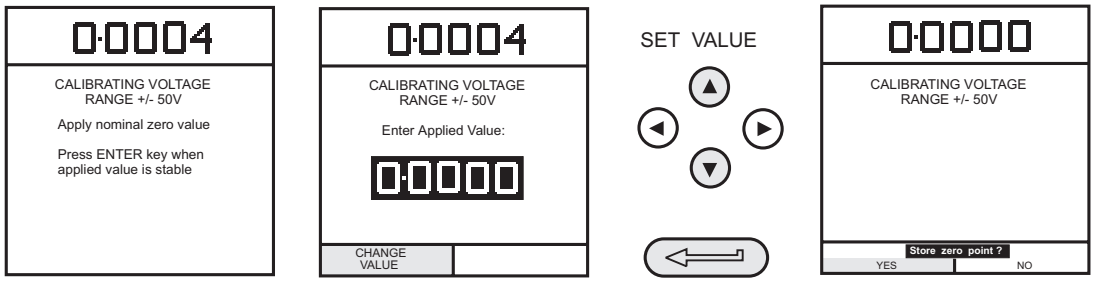
(1) Switch the calibrator on, enter CALIBRATION mode and select INT RANGES from the CALIBRATION MENU as shown on Page 5-2

.

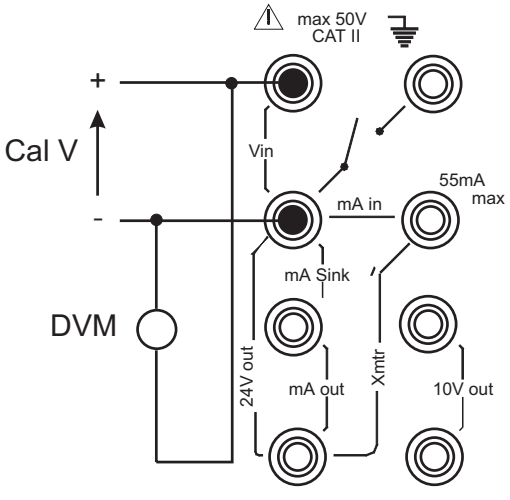
(2) Select 5V range for calibration as shown below.



(3) Link the voltage input terminals with a short lead and enter the zero point as shown below (e.g.),

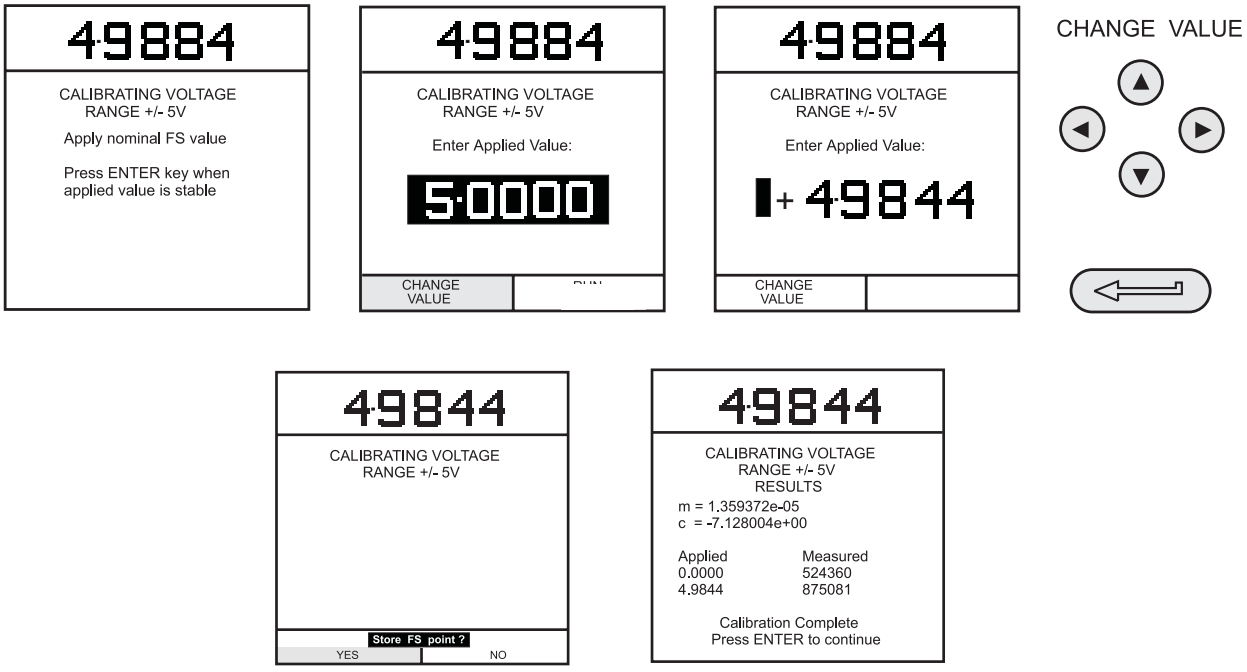


(4) Remove the shorting link from the voltmeter terminals, connect the **Vin** terminals of the calibrator to a variable voltage source and connect a digital voltmeter across the source as shown below.



Calibration Procedures

(5) Set the variable supply voltage to 5V ± 0.1V and enter the measured full-scale voltage applied as shown below (e.g.),



(6) Press the ENTER key to accept the calibration. Press the EXIT key once to return to the calibration menu or four times to quit the CALIBRATION and SETUP modes.

(7) Verify the calibrator calibration by applying the test voltages given in Table 5-2 to the voltmeter (after both voltage ranges have been calibrated).

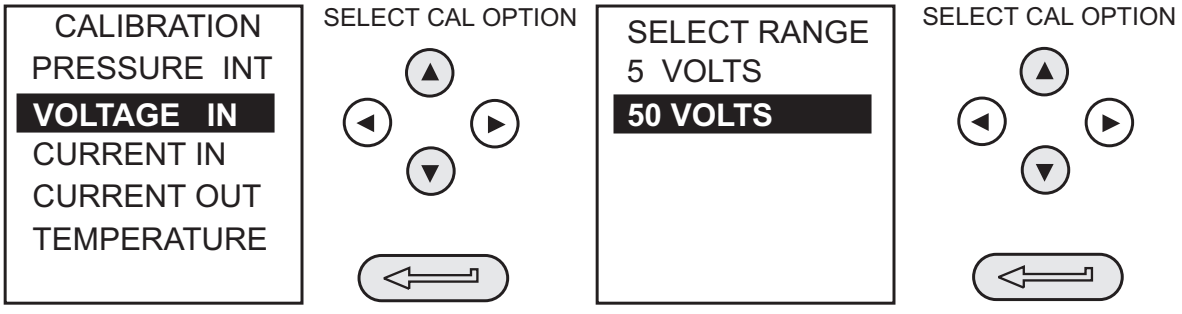
(8) Disconnect the calibration/test setup.

Voltage Input Range (50 Volts)

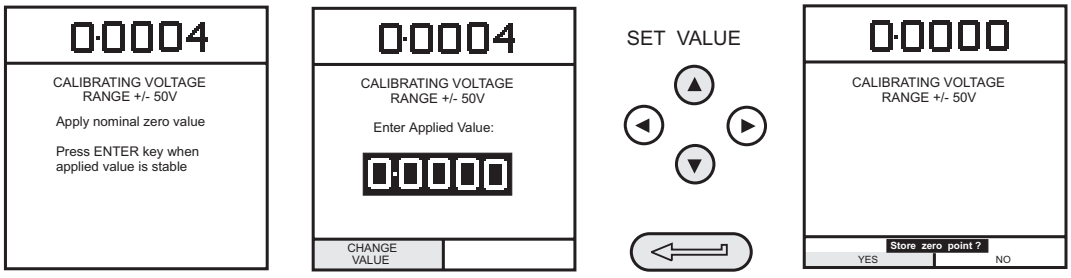
The following procedure should be adopted for calibrating the internal 50 Volt range,

(1) Switch the calibrator on, enter CALIBRATION mode and select INT RANGES from the CALIBRATION MENU as shown on Page 5-2.

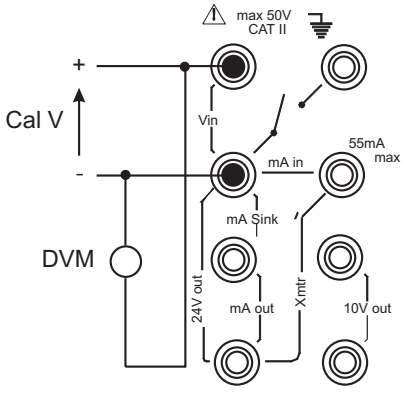
(2) Select 50V range for calibration as shown below.



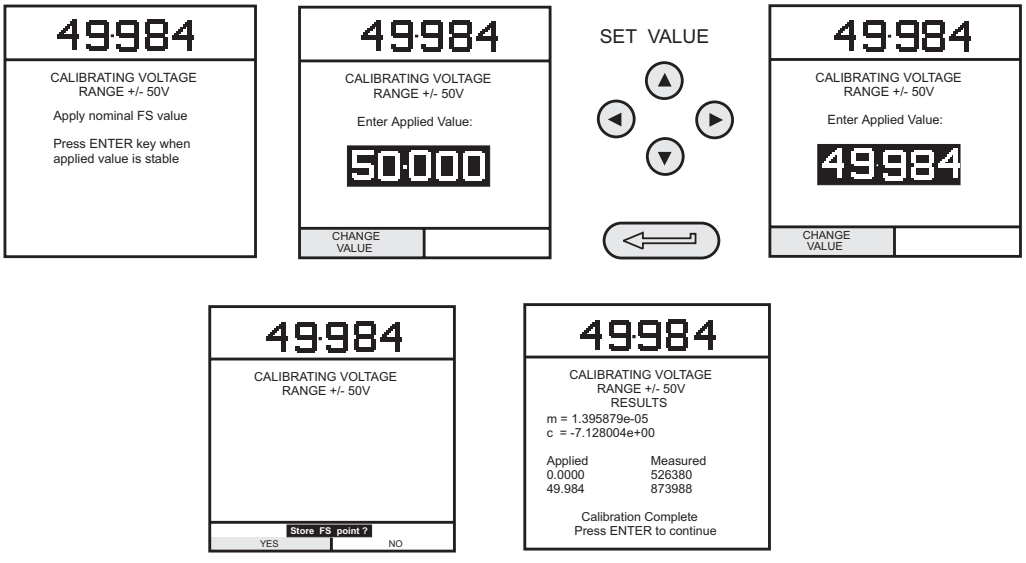
(3) Link the voltage input terminals with a short lead and enter the zero point as shown below (e.g.),



(4) Remove the shorting link from the voltmeter terminals, connect the Vin terminals of the calibrator to a variable voltage source and connect a digital voltmeter across the source as shown below.



(5) Set the variable supply voltage to 50V ± 0.1V and enter the measured full-scale voltage applied as shown below (e.g.),



(6) Press the ENTER key to accept the calibration. Press the EXIT key four times to quit the CALIBRATION and SETUP modes.

(7) Verify the calibrator calibration by applying the test voltages given in Table 5-2 to the voltmeter (after both voltage ranges have been calibrated).

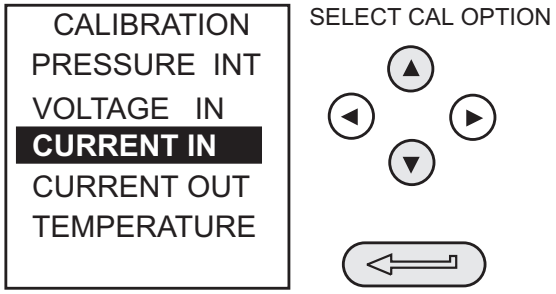
(8) Disconnect the calibration/test setup.

Calibration Procedures
Current Input Range (55 mA)

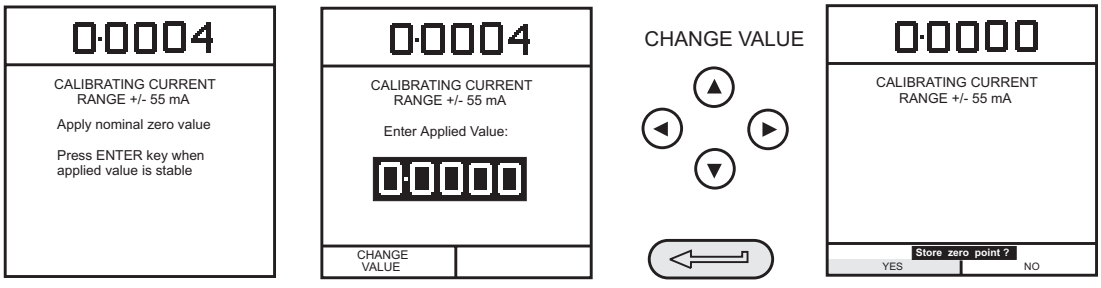
The following procedure should be adopted for calibrating the current input range.

(1) Switch the calibrator on, enter CALIBRATION mode and select INT RANGES from the CALIBRATION MENU as shown on Page 5-2.

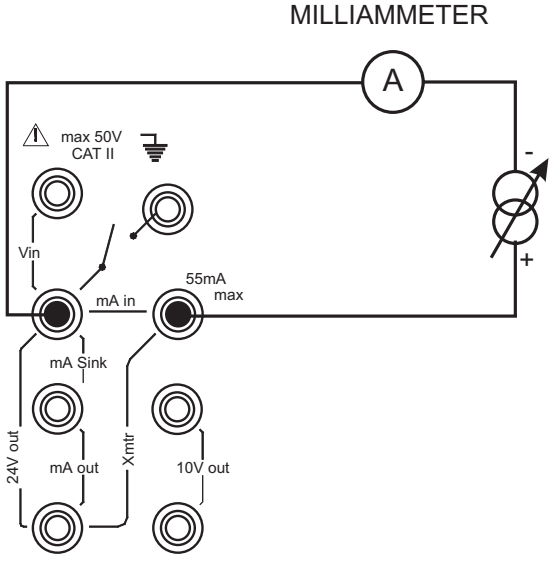
(2) Select CURRENT IN range for calibration as shown below.



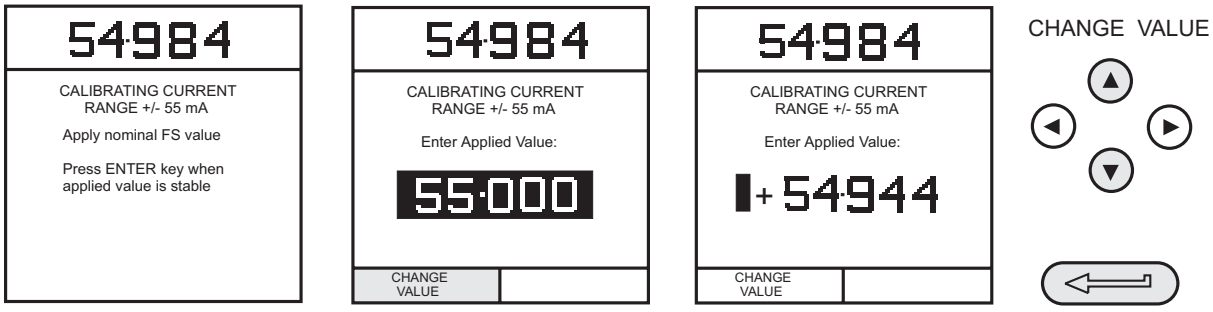
(3) Open circuit the **mA in** terminals and enter the zero point as shown below.

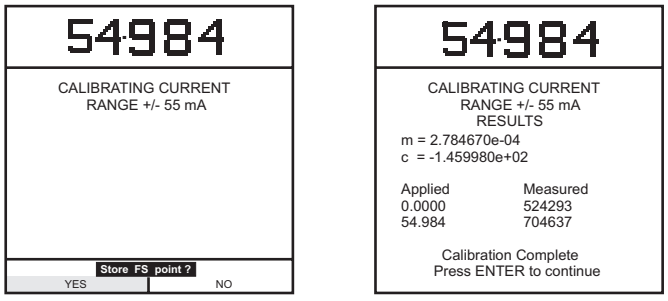


(4) Connect the mA in terminals of the calibrator to a variable current source and connect a digital milliammeter in series with the supply as shown below.



(5) Set the input current to 55 ± 0.1 mA and enter the measured full-scale input current as shown below (e.g.),





(6) Press the ENTER key to accept the calibration. Press the EXIT key four time to quit the CALIBRATION and SETUP modes.

(7) Verify the calibration by applying the test currents given in Table 5-3 to the milliammeter.

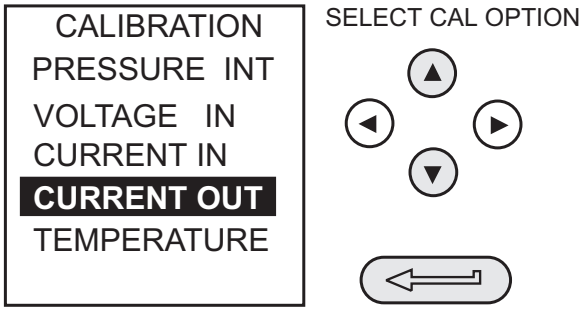
(8) Disconnect the calibration/test setup.

Current Output Range (24 mA)

The following procedure should be adopted for calibrating the current output range.

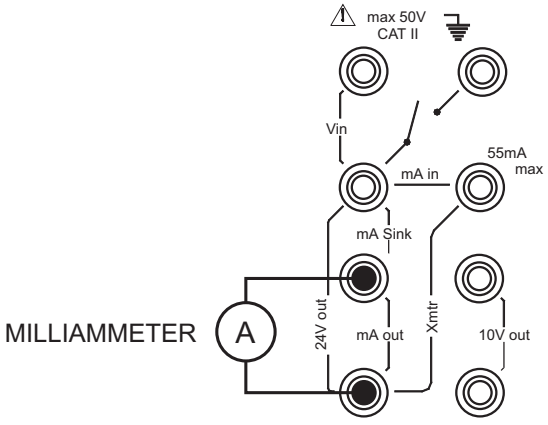
(1) Switch the calibrator on, enter CALIBRATION mode and select INT RANGES from the CALIBRATION MENU as shown on Page 5-2.

(2) Select CURRENT OUT range for calibration as shown below.

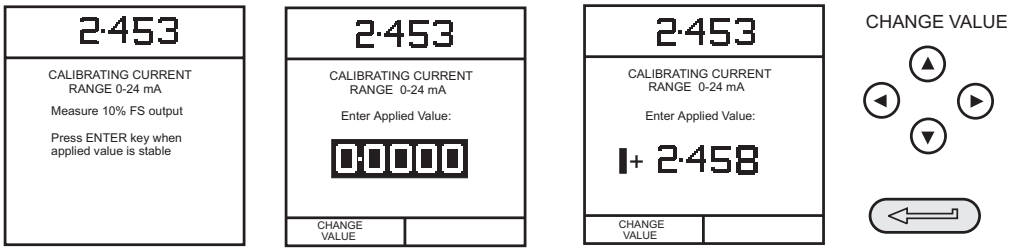


(3) Connect a digital milliammeter to the calibrator as shown below.

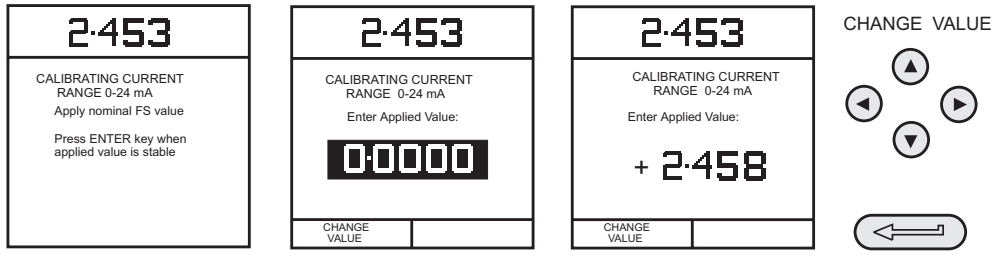
Note:
During a current out calibration routine, the 24V dc output is automatically turned on.

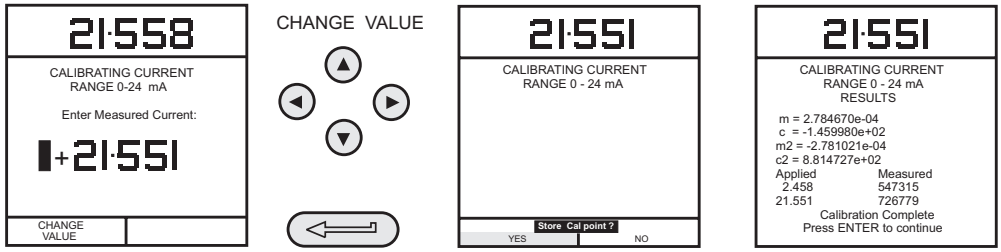


(4) Measure the 10% full-scale output current and enter the value measured on the external milliammeter as shown below (e.g.),



(5) Measure the 90% full-scale output current and enter the value measured on the external milliammeter as shown below (e.g.),

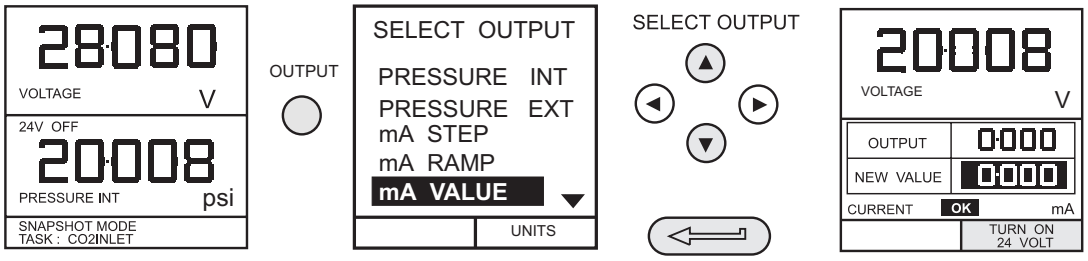




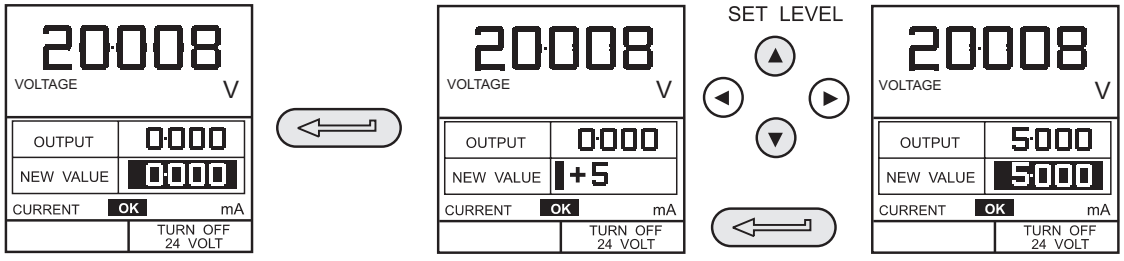
(6) Press the ENTER key to accept the calibration. Press the EXIT key four times to quit the CALIBRATION and SETUP modes.

(7) Verify the calibrator's output current calibration by setting up the loop test currents as shown in Table 5-4 and checking the set values against the milliammeter standard as follows.

(8) Press the OUTPUT key, select 24V and turn the 24V supply to ON. Proceed as follows (e.g.),



(9) Set the loop output current to 5 mA as shown below and check that the output current, measured on the milliammeter standard is within the limits given in Table 5-4.

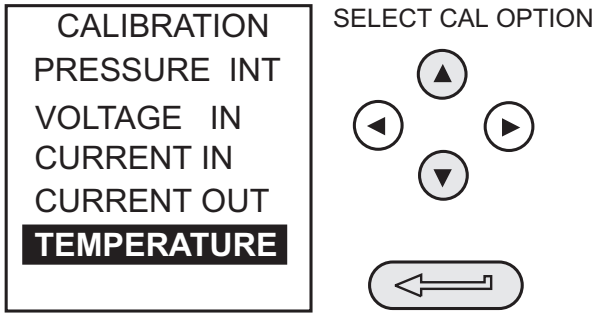


(10) Repeat (9) for all output values given in Table 5-4.

Calibration Procedures
Ambient Temperature Channel

The following procedure should be adopted for calibrating the ambient temperature measurement channel.

(1) Switch the calibrator on, enter the CALIBRATION mode and select TEMPERATURE as shown below.

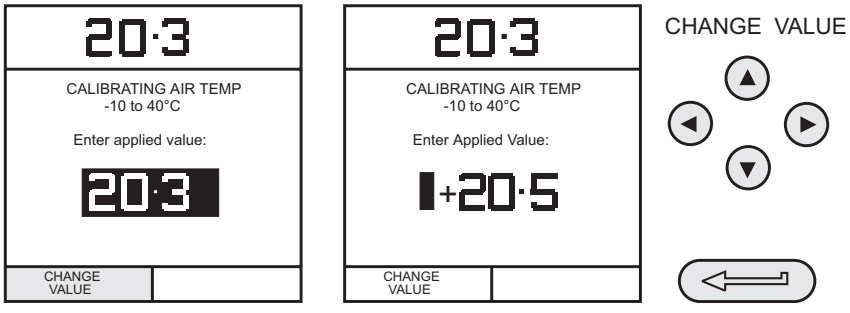


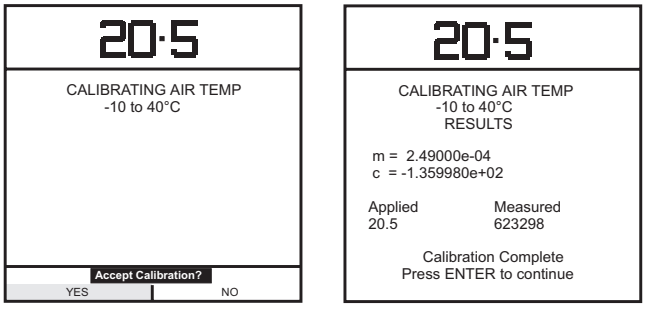
(2) Allow the calibrator's temperature to stabilize in the calibration environment for at least one hour.

(3) Read the environmental temperature on a calibrated digital thermometer and enter the recorded value as shown below. Example shown for a measured ambient temperature of 70.5 degrees Fahrenheit.

Note:

Only one temperature point is required.





(4) Press the ENTER key to accept the calibration. Press the EXIT key once to return to the calibration menu or four times to quit the CALIBRATION and SETUP modes.

Calibrate External Ranges

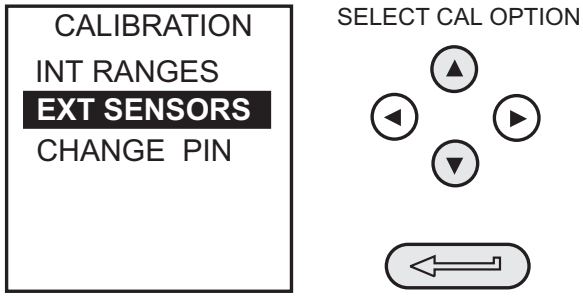
Pressure

The following procedure should be adopted for calibrating external pressure ranges.

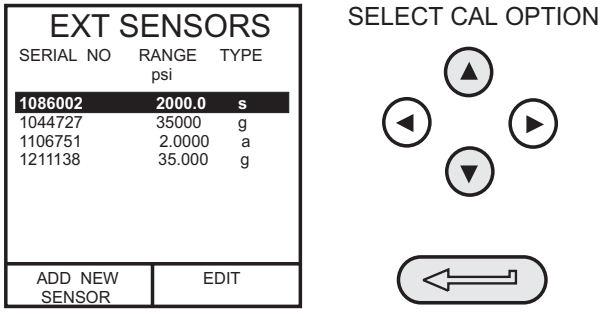
(1) Connect the required external transducer to the EXT TRANSDUCER socket.

(2) Allow the calibrator's temperature and the temperature of the external transducer to stabilize in the calibration environment for a minimum of 1 hour.

(3) Switch the calibrator on, enter CALIBRATION mode and select EXT SENSORS from the CALIBRATION menu as shown below.

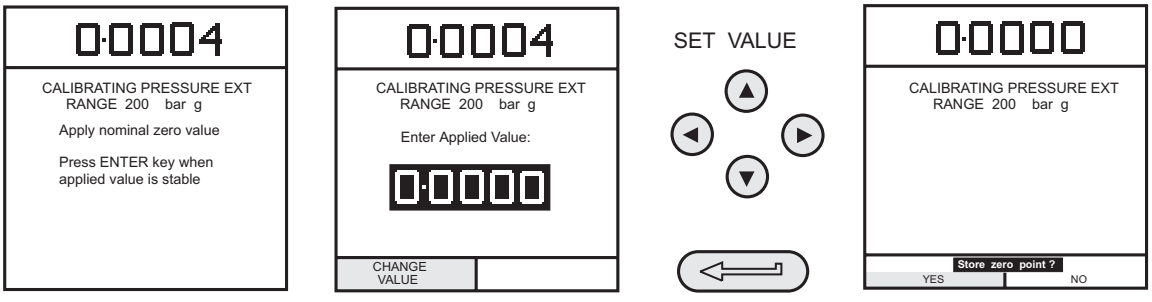


(4) Select the transducer to be calibrated from the transducer menu using the cursor keys and pressing ENTER as shown below.

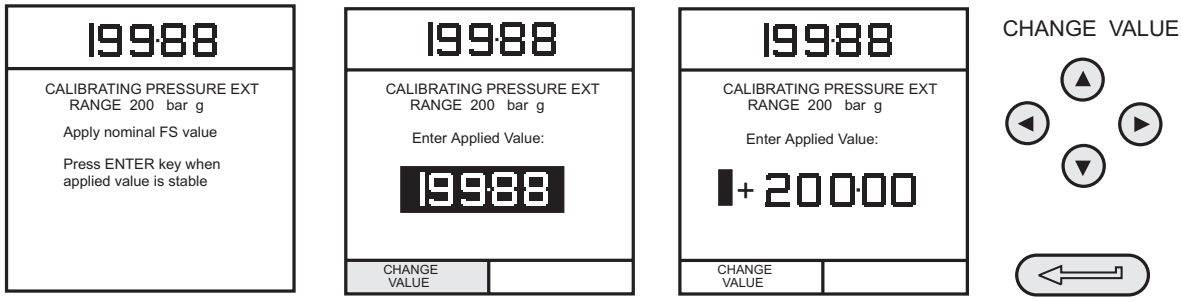


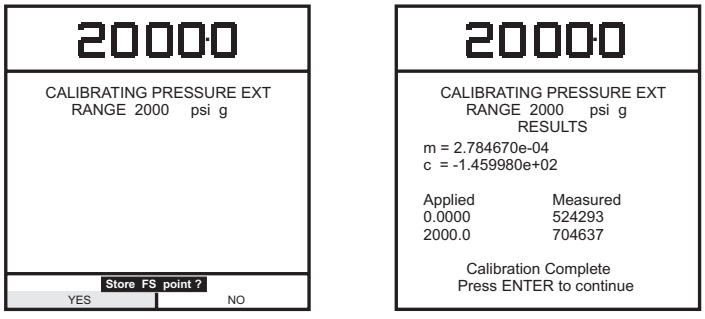
If the sensor to be calibrated is not in the directory, or no sensors are listed in the directory, press the F1 key (ADD NEW SENSOR). This stores the sensor in the directory, allowing it to then be selected.

(5) Connect the pressure standard to the inlet of the external transducer, apply the zero point pressure and store the zero point as shown below (e.g.),



(6) Apply the full-scale pressure to the external transducer and store the full-scale (FS) point as shown below (e.g.),





(7) Release the applied pressure and disconnect the pressure standard. Press the ENTER key to accept the calibration. Press the EXIT key once to return to the calibration menu or four times to quit the CALIBRATION and SETUP modes.

(8) Check the calibration of the external transducer by applying the test pressures as detailed in Table 5-1.

Nominal Applied Value as a % Full-Scale	Permissible Deviation
	DPI 320/325
0%	± 0.025 %FS
20%	± 0.025 %FS
40%	± 0.025 %FS
60%	± 0.025 %FS
80%	± 0.025 %FS
100%	± 0.025 %FS
80%	± 0.025 %FS
60%	± 0.025 %FS
40%	± 0.025 %FS
20%	± 0.025 %FS
0%	± 0.025 %FS

Table 5-1 - Internal/External Pressure Transducer Verification

Voltage Calibration 5V Range Verification Tolerances		Voltage Calibration 50V Range Verification Tolerances	
Applied Voltage	Permissible Deviation	Applied Voltage	Permissible Deviation
-5	± 0.05% rdg, ± 0.004% FS	-50	± 0.05% rdg, ± 0.004% FS
-4	± 0.05% rdg, ± 0.004% FS	-40	± 0.05% rdg, ± 0.004% FS
-3	± 0.05% rdg, ± 0.004% FS	-30	± 0.05% rdg, ± 0.004% FS
-2	± 0.05% rdg, ± 0.004% FS	-20	± 0.05% rdg, ± 0.004% FS
-1	± 0.05% rdg, ± 0.004% FS	-10	± 0.05% rdg, ± 0.004% FS
0	± 0.05% rdg, ± 0.004% FS	0	± 0.05% rdg, ± 0.004% FS
1	± 0.05% rdg, ± 0.004% FS	10	± 0.05% rdg, ± 0.004% FS
2	± 0.05% rdg, ± 0.004% FS	20	± 0.05% rdg, ± 0.004% FS
3	± 0.05% rdg, ± 0.004% FS	30	± 0.05% rdg, ± 0.004% FS
4	± 0.05% rdg, ± 0.004% FS	40	± 0.05% rdg, ± 0.004% FS
5	± 0.05% rdg, ± 0.004% FS	50	± 0.05% rdg, ± 0.004% FS

Table 5-2 - Electrical Voltage Input Calibration Tolerances

Current Calibration, 55mA Range Verification Tolerances	
Applied Current	Permissible Deviation
-55	± 0.05% rdg ± 0.004% FS
-45	± 0.05% rdg ± 0.004% FS
-35	± 0.05% rdg ± 0.004% FS
-25	± 0.05% rdg ± 0.004% FS
-15	± 0.05% rdg ± 0.004% FS
-5	± 0.05% rdg ± 0.004% FS
0	± 0.05% rdg ± 0.004% FS
5	± 0.05% rdg ± 0.004% FS
15	± 0.05% rdg ± 0.004% FS
25	± 0.05% rdg ± 0.004% FS
35	± 0.05% rdg ± 0.004% FS
45	± 0.05% rdg ± 0.004% FS
55	± 0.05% rdg ± 0.004% FS

Table 5-3 - Electrical Current Input Calibration Tolerances

Current Output Calibration 24mA Range Verification Tolerances	
Applied Current	Permissible Deviation
0	± 0.05% rdg ± 0.01% FS
5	± 0.05% rdg ± 0.01% FS
10	± 0.05% rdg ± 0.01% FS
15	± 0.05% rdg ± 0.01% FS
20	± 0.05% rdg ± 0.01% FS
24	± 0.05% rdg ± 0.01% FS
20	± 0.05% rdg ± 0.01% FS
15	± 0.05% rdg ± 0.01% FS
10	± 0.05% rdg ± 0.01% FS
5	± 0.05% rdg ± 0.01% FS
0	± 0.05% rdg ± 0.01% FS

Table 5-4 - Current Output Calibration Tolerances